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ORIENTAL IMMIGRATION IN BRITISH
COLONIES AND DOMINIONS

JAPAN'S FOREIGN POLICY

A JAPANESE TALKS TO AMERICA

Vol. XXIX

NOVEMBER, 1933

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Oriental Immigration in British Colonies and Dominions

By KOYO SUE INUI, LL.D

(For a number of years an outstanding work devoted to the general subject of Oriental immigration has been "The Unsolved Problem of the Pacific" by Kiyo Sue Inui. The accompanying article consists of a revision of an essential portion of this book, which is to appear shortly in revised and enlarged form. Doctor Inui is an expert attached to the Japanese Legation in China; some time Professorial-Lecturer in International Relations, Tokyo University of Commerce; formerly General Secretary, The Japanese Association of America; Lecturer in California and Occidental College and Delegate, the League of Nations Association of Japan 1922-23. He was Member of the Japanese Delegation to the Special Customs Conference, Peking, 1925-26 and served as Expert of the Japanese Delegation to the World Economic Conference, Geneva, 1927).

* * *

THE subject of discrimination against Orientals in other countries besides America is of wide scope and needs special treatment. Since Mr. Albert Johnson, father of the American Immigration Measure, and the people of like mind seem to be much concerned because Japan is not disposed to protest against the exclusion policies of other countries, which discriminate against the Japanese, we shall make merely a few passing observations in way of comparison. He says in his report to the House Committee on Immigration and Naturalization at Washington:

"South Africa, Australia and New Zealand promptly gave the necessary notice and provided by various methods for absolute exclusion of Japanese immigration, an action which Japan never protested. Canada failed to take similar action, but later sought to remedy the omission by a gentlemen's agreement with Japan, limiting yearly admissions from Japan to 400. This agreement has not worked satisfactorily to Canada, and the Dominion Parliament in May, 1922, requested the Government to take immediate action looking to exclude further Oriental immigration."*

No one can wash blood with blood. A neighbor's wrongdoing does not justify like action. Nor are all of these cases exactly analogous. The only analogy is psychological. Their reactions are identical, though their expressions and methods may be dissimilar. The British Colonies and Dominions and the United States are no different in their response to the appeal of new nationalism, assertive democracy, exacting intolerance and exuberant idealism. But unlike the latter the former realizes a larger co-operative responsibility toward the British Empire. On the whole "the mother's wisdom" and guidance have acted as a wholesome check upon the attitude of impulsive youth.

It is true that so far as Canada is concerned she became, from 1893, practically autonomous in the matters of international commercial treaties and treaty making, so much so that the then British Colonial Minister Ripon feared that it would be the beginning of the disintegration of the British Empire.† With the increasing importance of the Colonies and Dominions, "the right of a self-governing community to control immigration, that is, to decide the future composition of its own population, was first asserted by the Australian Colonies in connection with the immigration of Chinese in the latter half of the nineteenth century."‡

Upholding the above principles Sir Henry Parkes justified the drastic action in excluding Chinese immigrants in 1888:

"In founding a free State no nationality or class should be considered whom we are not prepared to admit to all our franchises, all our rights of property, all our privileges of citizenship, all our social usages and trusts not excluding inter-marriage."§

A basic treaty which has an important bearing upon the international relations of the British Dominions and Colonies was concluded on July 16, 1894, between Great Britain and Japan. It guaranteed the subjects of each of the High Contracting Parties, "full liberty to enter, travel, and reside in any part of the dominions and possessions of the other Contracting Party." "This treaty, however, did not apply to the Dominion of Canada and to the Australian and South African Colonies, etc., except upon notice given by the British Government within two years."||

None of the Dominions or Colonies was in a hurry to adhere to the Treaty of 1894. On the contrary the Canadian Government decided, on July 29, 1896, not to follow in the footsteps of her mother country. In August, an exchange of notes between Great Britain and Japan extended the time in which the dominions might accede for one year. Meanwhile, Newfoundland, Natal and Queensland acceded subject to the freedom to restrict Japanese laborers.

Canada and Japanese

On June 7, 1905, the Canadian Government finally declared that the obstacles to acceding to the Treaty of 1894 had been removed. The British Government sent two telegrams, at least, inquiring if Canada wished to accede to the Treaty of 1894 subject to the original stipulation in regard to immigration laws. But the Canadian Government appeared to believe that the immigration question had been solved by the Japanese restriction law, that Japan would not now agree to the original immigration proposal. On September 25, 1905, it passed an Order in Council stating that Canada would adhere to the Japanese Treaty of 1894 'absolutely without reserve.' On January 31, 1906, the British and Japanese Governments signed a supplementary convention at Tokyo (ratified July 12) which extended the Treaty of 1894 to Canada."¶

With the high immigration tide of 1907, about 4,400 Japanese entered Canada, mostly from Hawaii. The conclusion of the Gentlemen's Agreement of the United States and Japan prompted the consummation of the Canadian Gentlemen's Agreement. This also was brought about by an exchange of letters between the Governments, Rodolphe Lemieux, Minister of Labor for Canada and T. Hayashi, Minister of Foreign Affairs for Japan, in which the latter stated in a letter dated December 23, 1907, that his Government would take "efficient measures to restrict emigration to

*Johnson Report, Gaimusho; Op. Cit. p. 138.

†Hall, Prof. H. Duncan; The British Commonwealth of Nations, pp. 134-5.

‡Ibid., p. 138.

§Parkes, Sir Henry; Fifty years in the Making of Australian History, Vol. II., p. 207.

¶Buell; Op. Cit. Japanese Immigration, p. 334.

¶¶Quoted by Buell from "British and Foreign State Papers," Vol. 99, p. 139.

Canada," although the Japanese were to enter, travel and reside freely in the territory of the Dominion.

The understanding thus entered into between the two Governments allowed the entrance of returning aliens together with their wives and children besides such people as Government officials, travelers and merchants, in addition to domestic and agricultural laborers not to exceed 400, which numerical restriction Japan placed upon herself and which was later reduced to 150. In May, 1928, because of the constant agitation along the western shores of Canada, Japan agreed not to send the so-called picture brides and it was also arranged so that the families of these domestic and agricultural laborers would be included in the number, which means practically absolute prohibition except in name. However, let it be understood that that means everything to Japan.

A new Treaty of Commerce and Navigation was entered into between Japan and the British Empire on April 3, 1911.* Like the Treaty of 1894, Article 1 stipulated among others, "the subjects of each of the High Contracting Parties shall have full liberty to enter, travel, and reside in the territories of the other." The treaty was not to be applicable to the Colonies and Dominions unless they adhered within two years.

Meanwhile Canada enacted the Immigration Act of 1910 giving the Governor-General power to exclude whatever racial or national group he liked :

"The Governor in Council may, by proclamation or order whenever he deems it necessary or expedient,

(c) prohibit for a stated period, or permanently, the landing in Canada, or the landing at any specified port of entry in Canada, of immigrants belonging to any race deemed unsuited to the climate or requirements of Canada, or of immigrants of any specified class, occupation or character."

In the course of correspondence between the Canadian Government and Consul-General Nakamura, Canada expressed its willingness to adhere to the treaty subject to the provision that the treaty shall not be deemed to repeal any of the provisions of the Immigration Act of 1910. To this "the Japanese Consul-General stated that Japan would not object to Canada's proposal, since it 'felt assured that the Immigration Act of Canada of 1910 being applicable, as stated in your note, to the immigration of aliens into the Dominion of Canada from all countries including the British Empire itself, no discrimination will be made against Japanese subjects in this respect.' Thereupon Canada passed the Japanese Treaty Act of 1913."

This accession of Canada was followed by a declaration on the part of Japan, as in the case of the Gentlemen's Agreement between America and Japan. It stated that the Japanese Government "are fully prepared to maintain and intend to maintain with equal effectiveness the limitation of emigration from Japan to Canada."

Like the fruit and vegetable industry in California, the development of the fishing business in Canada practically owes its all to the Japanese pioneers. There as in other states, the control of sea fisheries is left to the Dominion Government. But as a matter of practical administration the opinions and conveniences of the provinces directly concerned with the fishing are taken into consideration. It is for this, in spite of the fact that the majority of the Japanese fishermen are naturalized Canadians, that annoying discrimination has taken place.

Within the last few years there arose a rather unfortunate international problem or a domestic Canadian problem of international importance. In the world of contact opposition usually comes to a head in the way of advance. When the Japanese in California were laborers, it was directed against them as laborers. When their activities began to be those of small merchants, it appeared most in the form of commercial regulations. When they entered into farming communities it crystallized as anti-Japanese land measures. So in Canada, it is in the field where Japanese are most successful that Canadian opposition also is found, resulting in discrimination.

British Columbia is "the California of Canada, which wishes to manage what she considers are her own affairs, and this in her own way, enthusiastically and confidently. As California overstepped her legal boundary in asserting her rights and enacted more unconstitutional laws than any part of the Union during her short experiences of statehood, so British Columbia, with her self-directing spirit and her dogmatic directness started a question-

able drive against the fishermen of both Japanese nationality and naturalized Japanese.

There were in 1926, 21,000 Japanese in the Dominion, almost all of whom reside in British Columbia. According to the figure of 1923 there were 7,723 naturalized and 3,692 Canadian-born Japanese making a total of 11,415 Japanese who were Canadian citizens out of the then total of Japanese population of 17,691. Of this number about 4,000, or 25%, were either directly or indirectly interested in fishing. Mr. Fumio Morita gives the following statistics for 1926 of those directly concerned in the fishing districts of British Columbia.

| District | Number engaged | Capital invested | Amount yield |
|-------------------------|----------------|------------------|--------------|
| First | 685 | \$7,750,000 | 685,000 |
| Second | 875 | unknown | 348,400 |
| Third | 235 | \$276,000 | 470,000 |
| Herring-fishing | unknown | 660,000 | 1,500,000 |
| Total | 1,785 | \$1,686,000 | 3,003,400 |

The same authority also describes the following five methods through which the people of Japanese descent were discriminated against. In April, 1921, the Dominion Government issued an order, in accordance with the Dominion Fishery Regulations of 1919 Relating to British Columbia, that the number of licenses to be granted to fishermen (British subjects) other than the whites and natives, shall not exceed those granted in the previous season.

(1) It was further ordered that the above restriction applied to all fishing licenses which shall not exceed the number of 1919. Those Japanese who come under these regulations are naturalized. Legally speaking, therefore, Japan entertains no grievance for them. But curing is supposed to be open to all, including foreigners, and not excluding Japanese. Hence, some of our nationals who come under the jurisdiction of the Treaty of Commerce and Navigation between Japan and the British Empire, felt that it included the right of curing consonant to the manufacturing industry stipulated in the treaty. Although the Canadian Government took the view that that had no place in the agreement, she withdrew this part of the restrictions.

(2) But other forms of fishing regulations were kept in force. Furthermore, up to 1921 a license to fish a certain specified variety once granted, entitled the fishermen to catch the same species in any other districts. But from that year its validity was limited only to the original district from which the license was granted. Again, from 1922 the number of licenses for salmon fishing in the Third District was reduced by 35% from the preceding year. In addition, although heretofore one license entitled a man to fish on both shores of the Vancouver Island, they came to be divided. After that, in 1923, 25% reduction in the Third District and 40% in other Districts were brought about. On top of that it was further made necessary to receive licenses for cod-fishing and salmon fishing—help which had not been required previously. And the use of no net was to be allowed to naturalized Japanese except for herring. In 1924 a further reduction of 15% in salmon licenses, 40% of cod licenses; in 1925 a general reduction in all licenses except in herring; in 1926 15% in salmon and cod, were made. In April, 1926, the Marine and Fishery Committee of the House of Commons decided to reduce the licenses to all Orientals by 10% each year beginning 1927 and to withdraw them totally by 1937. The resolution to that effect passed the Parliament and it was about to become an actual administrative measure.

(3) Though there was no restriction regarding the licenses in herring fishing there was one as regards fishing crews. According to the instruction of 1923 of the Minister of Fishery, from 1924 it was required to employ 25% of white or native help, 50% from 1925, 75% from 1926 and from 1927 none but the whites and natives were to be allowed to work in herring fishing. All of a sudden in 1926, it was ordered that laborers were to be exclusively whites and natives.

(4) Although herring fishing was, at the outset confined to the vicinity of Nanaimo, the Eastern shores of the Third District

*Cf. Appendix No. 65.

†Sec. 38, Act of May 4, 1910, 9-10 Edw. VII, Chap. 27.

‡Buell: Op. Cit. p. 337.

§Ibid. p. 338.

¶Revue Diplomatique, No. 571 Sept. 15, 1928, p. 101.

¶Ibid. pp. 102-5.

through the effort of the fishermen of Japanese descent, gradually the Western shores were also opened for their activities. Due to the slowness of currents it was easier to fish on the West shores as compared to the East. The white fishermen, claiming the privileges of the shore property, often placed obstacles in the way of the Japanese. Eventually the fishing area of the Orientals was limited to some 50 square miles of a certain section.

(5) Not only were the fishermen of Japanese descent so reduced to a minimized area, but their stores of salted fish were placed under discriminated tax levy. From August, 1923, the fishery official stationed at Nanaimo, claiming as the instruction from the Dominion Government, undertook to levy, from 1922-3 \$1.25 per ton from those producing over 50 tons of salted herring, except those stored in the cannery or pickle factories. The proprietors of these establishments being white fishermen, the excessive burden was to be borne by the Japanese only. This regulation was continued another year on the same basis, though it was changed eventually so as to apply to all alike.

It is obvious that these discriminatory treatments involve two aspects of Japanese-Canadian relations, one that has to do with the discrimination against Japanese subjects who are there legally and under the British-Japanese Treaty of 1911, and the other that has to do with those Japanese who are naturalized Canadian citizens over whom Japan has no political and legal claim, but over whom she has naturally a psychological and irredentist interest. Just as the naturalized Japanese were about ready to take up the question before the court, the Japanese Consul-General at Ottawa took the matter up with the Dominion Government.

One does not need to look very far in order to discern that the prohibition and restriction of the employment of the Japanese was contrary to paragraphs 2 and 3 of Article 1 of the British-Japanese Treaty:

"2.—They shall have the right, equally with native subjects, to carry on their commerce and manufacture

3.—They shall in all that relates to the pursuit of their industries, callings, professions and educational studies be placed in all respects on the same footing as the subjects or citizens of the most favored nation."*

But the Canadian Government was not inclined to view the situation in the same way. They felt that the law was mandatory upon them; but they seemed to be kindly disposed to make the whole question an issue in court. Simultaneously there arose another dispute over the question of constitutional validity of certain sections of the Fisheries Act of 1914. Hence, through a special dispensation of the Minister of Justice, the Japanese fishermen's case was brought up to the Supreme Court at once in a joint hearing with that of the Millard Cannery. The task before the court was to pass upon the following three questions, the first and last of which were so vitally concerned with the subject of our study:

"1.—Are sections 7A and 18 of the Fisheries Act, 1914, or either of them and in what particular or particulars or to what extent *ultra vires* of the Parliament of Canada?

"2.—If the said Provisions of the Fisheries Act, 1914, or either of them be *intra vires* of the Parliament of Canada, has the Minister authority to issue a license for the operation of a floating cannery constructed on a float or ship, as contradistinguished from a stationary cannery constructed on land, and if so, is he entitled to make the license subject to any restrictions particularly as to the place of operation of any such cannery in British Columbia?

"3.—Under the provisions of the Special Fishery Regulations for the Province of British Columbia (made by the Governor in Council under the authority of Section 45 of the Fisheries Act, 1914) respecting licenses to fish, viz., subsection 3 of Section 14; paragraph (a) or (b) of Subsection 1 of Section 15 or paragraph (a) of Subsection 7 of Section 24 of the said Regulations, or under said Section 7A or 18 of the said Act (if these sections or either of them be *intra vires* of the Parliament of Canada), has

(a) any British subject resident in the Province of British Columbia, or

(b) any person so resident who is not a British subject, upon application and tender of the prescribed fee, the right to receive a license to fish or to operate

a fish or salmon cannery in that Province, or has the Minister a discretionary authority to grant or refuse such license to any such person whether a British subject or not?†

The Court's Ruling

The three questions were answered on May 28, 1928, in part, in the following brief and precise manner:

"The Supreme Court of Canada unanimously decides that Section 7A and 18 are *ultra vires*. In view of the preceding answer Question 2 requires no answer. As to Question 3, Anglin, Newcombe, Rinfret and Lamont say that any British subject resident in British Columbia, not otherwise legally disqualified, has the right to receive a license if he submit a proper application and tender the fee. As to any person resident in British Columbia who is not a British subject, he is not eligible for a license of the character described in Subsection 3 of Section 14, which expressly declares that no other than a British subject shall be eligible for such license. None of the other licenses as provided in Paragraph B of subsection 1 of Section 15 shall be granted to any person unless he is a British subject resident in the Province or is a returned soldier who has served in the Canadian Army or Navy overseas. It is unnecessary to interpret the regulations with respect to the operation of fish or salmon canneries as Section 7A and 18 of the Act are held *ultra vires*. Duff, Mignault and Smith say the Minister has a discretionary authority with regard to British subjects and returned soldiers who served in the Canadian Navy or Army overseas."‡

Now that the question is settled, there are now three possibilities so far as the Canadian citizens of Japanese descent are concerned: to take the case to the Judiciary Committee of the Privy Council in London; to improvise a new regulation so as to make fishing by the Canadians of Oriental descent illegal; or to let the question rest where it stands.

It is true that even after the highest court of Canada gave judgment, there still remains another legal step to which the parties may resort. In 1918 at the Imperial Conference, Premier Hughes of Australia declared that there is no longer the necessity of appealing to London, if the wishes of the people of Australia were consulted. Since then so far as that Member of the British Empire is concerned, no case is brought unless the highest court of the Commonwealth so decides. The Imperial Conference of 1926 left the decision on this question to a later date. In the Japanese fishermen's case ultimately the Canadian Government decided to take the case to the Judiciary Committee of the Privy Council and when this was done the decision of the Canadian Supreme Court was sustained.

Although this outcome of the case has taken place it is not impossible to improvise a new regulation. Such a plan is hinted at by Mr. A. W. Neill, M.P., from British Columbia; whether his associates can muster sufficient votes and whether they can formulate a law without overstepping the constitutional guarantee of the people of Canada is problematical to say the least. A similar threat has often been made by the anti-Japanese group of the Pacific coast of the United States, who propose even to effect a Constitutional amendment in order to deprive the American citizens of Japanese parentage of the right to vote. So far they have not been successful.

The only other course that remains is for British Columbia to let the matter rest where it is, which seems to be the only sane attitude to take in this matter. But it must be here recalled that so long as these Orientals are not allowed to participate in suffrage, the Canadian-Japanese problems can hardly be said to be solved. The differentiation will be a constant reminder of their racial origin and consciousness which should be overcome by a wise organization of a community of interest and common participation; that alone will win the confidence and loyalty of strangers.

*Cf. Appendix No. 65.

†By Order in Council of the 19th October, 1927, (P.C. 2032) (Case, pp. 2-3) His Excellency the Governor-General in Council was pleased to refer to the Supreme Court of Canada, for hearing and consideration, pursuant to section 55 of the Supreme Court Act.

‡Cf. Appendix No. 67.

But the greatest problem of Canada, especially of British Columbia is not so much the insoluble mud in the pond as it is the young excited urchin who keeps it ever muddy by constant stirring. The overzealous politicians or sometimes self-styled saviors of the state have too often used these helpless foreigners or newcomers as convenient political goats and produced "problems." In the absence of the law of nations among civilized communities to deport them, left alone, wisely guided by humane and fellow feeling and allowed the privileges of participating in a common undertaking, these so-called foreign elements, when settled down into a normal life, may yet prove to be a very solid foundation upon which to build nations and states.

The other major problem that is left is the question of the treatment of those Japanese who come under the Treaty of 1911. No doubt there is room for arguments on both sides. The right of fishing within territorial waters may be an exclusive question of the nation concerned. But such privileges are widely granted to foreigners in many countries, both as regards the operation of fishing and fishing laborers. But so far as the questions of salting and curing are concerned no nation is entitled to make a narrow dogmatic interpretation of "manufacturing." For "manufacturing" essentially has to do with the creation of value by change of shape, form or constituency and which should be distinguished from mere storage.

In international dealings a narrow interpretation is both unwise and dangerous, as is so well recognized by the rules of treaty interpretation.

We appreciate that it is too much to expect disinterestedness of a new, growing and subjective frontier community, but we hope that the more settled and better organized portion of Canada will prevail with its characteristic sound and solid common sense and fairness in these delicate problems of international contact.

Australia and Orientals

The position of Australia shows even a more characteristic attitude of a true frontier community. She sought to create her nationalism through racialism and exclusivism which were prompted by fear of an outgroup; and like California, they express themselves most conspicuously through their labor and agrarian elements. "The grounds for such exclusion were that these peoples (Asiatics and Africans) could not be assimilated, that their presence in any large numbers would undermine the foundations—economic, political and social—of Australasian civilization, and that, as a result, Australia and New Zealand would become racially, as they were geographically, appendages of Asia."*

The fear of the outgroup and assertive democracy of the ingroup, together, in the far distant frontier community, brought about the exclusion of Asiatics and Africans even before the Federation, and that proved to be one of the first acts of the Commonwealth, in which New Zealand followed the example of its bigger sister. In this connection a general line of effort exerted by Sir Henry Parkes is interesting. He says that it was "to promote the sentiment and to strengthen the nascent ties of Australian union" and to "cling to the idea of the expanding greatness and integrity of the Empire."†

It is true that the "White Australian" policy has been successfully used in achieving the objectives above described. Of all nationalistic slogans, it is the crudest and most acrimonious. When taken alone, the Australian colonies are no different in their provincialism, and their expressions are just as inelegant as they were in the earlier demonstrations of California against the Orientals. But as to the Commonwealth, there is no immigration law discriminating against the Japanese or Orientals as such. For tempered by the greater Imperial interests, she chose a less offensive course *vis-à-vis* foreign countries.

In 1901 Australia adopted a system of literacy tests which involve a European language. It is applied in such a manner as to virtually prohibit Oriental laborers from entering the Commonwealth. In 1905, it was decided after some correspondence between Japan and Australia that Japanese tourists, merchants and students entering temporarily, should be exempted from this test. Several modifications of law were then effected, including the change of the phrase, "any European language" into "any prescribed language." According to the modification, in case Australia concludes an agreement with another country relative

to the admission of her nationals, the said dictation test was to be dispensed with.‡

Therefore, those who are allowed under the present system, are as follows:

- (1) Returning aliens who had established the right of residence prior to 1901, and their wives (in the case of Asiatics, however these women do not enjoy the same status with their husbands unless they had attained it prior to 1901);
- (2) Those who passed the prescribed dictation test, according to the regulations of 1905;
- (3) Captains and ships' crew;
- (4) Consular agents and special envoys;
- (5) Those exempted by special arrangements (of 1904 with Japan, for instance, exempting merchants, students and tourists. The period of their stay is limited though it is renewable);
- (6) Those who deposited bonds (which are usually £100);
- (7) Domestic servants;
- (8) Those temporarily allowed by special administrative dispensation (of the customs collectors, for instance, in pearling districts through the permission of the Department of Interior of the Federation).§

"There appears to be no federal restrictions in regard to land-holding of aliens, although the federal government has power to legislate in regard to aliens. Several States, however, impose restrictions on acquisition or use of Crown lands by Orientals, although only in South Australia are Asiatics openly discriminated against."||

Not long ago in Australia, an applicant for naturalization could not be an aboriginal native of Asia, Africa or the Islands of the Pacific, except New Zealand. But according to the present practice, the matter is completely left to the discretion of the Governor-General.¶

However when we examine the laws and regulations of individual provinces there are still some obnoxious and tantalizing restrictions and prohibitions which are considered to be out-of-date or, at least, are not in keeping with the spirit and demands of the times. In these each of the provincial codes must be consulted, as they are no more uniform in regard to agriculture, fishery and factory regulations than are those in the United States.

Fishery and Fishing Labor :

This is about the only industry in which colored peoples take such a recognized part of importance. According to the Gaimusho Report of 1927, out of 2,060 Japanese in Australia and New Zealand, 963 belonged to this category; and with the exception only of seven they were all laborers. In New South Wales there is no discrimination in matters of fishing or oyster cultivation, although none but natives and naturalized Britishers are eligible to become members of the Board of New South Wales.** In Queensland, no foreigner is granted a license to operate a fishing vessel unless he has passed the dictation test.‡‡ Hence, the Japanese are not in a position to engage in fishing or pearling or catching of porpoises, sponge and other sea products. At best they can only be employed as fishing laborers in these undertakings.§§ There also seems to be somewhat similar restrictions in pearling in West Australia:|||| and none but those who have passed the dictation test are allowed to own a ship.

Agriculture and Agricultural Labor :

With regard to agriculture there is much more obvious and open discrimination between the natives and naturalized Britishers on the one hand and Orientals on the other, though such is not the case apparently in Victoria. In Queensland no one is eligible to

*Hall; Op. Cit. p. 138.

†Parkes, Sir Henry; Fifty years in the Making of Australian History. Vol. II, p. 283.

‡Buell; Op. Cit. p. 340.

§Gaimusho; Conditions of the Japanese Pearling Laborers in Australia. p. 5.

|| Buell; Op. Cit. p. 340.

¶Gaimusho; Legal Status of Foreigners in Other Lands, p. 96.

**Gaimusho; Conditions of the Japanese Pearling Laborers in Australia. p. 9.

‡‡Section 7, the Pearl Shell and Beche-de-Mer Fishery Act Amendment Act, 1913.

§§About 3,000 are thus engaged, of whom about 700 are Japanese.

|||| Gaimusho, Op. Cit. pp. 9-10.

take up public land unless he has passed the dictation test. And even after he has received the right his title becomes void unless he becomes naturalized within five years. Furthermore, unless one has passed the dictation test he is not allowed to lease, by any means, more than five acres.* For sugar and banana cultivation and labor the literacy test is also required.

According to the Irrigation and Reclaimed Land Act of South Australia, 1914, no Oriental enjoys the right of leasing any irrigated land.†

Navigation and navigators :

As the Navigation Act (of 1912-20) aims at the protection of the native shipowners and sailors, various restrictive measures are imposed upon foreigners. That the coastwise trade is not allowed to alien vessels, without the permission of the Governor-General, though many conditions are attached to such a permission. As regards the ownership of vessels, it might be said that no foreigner is allowed to own them inasmuch as it comes under the British Ships Act. The crews of those vessels of Australian registry and those engaging in the coastwise trade of Australia are required to be British subjects who are able to speak the English language.‡

Within the stipulations of the Post and Telegraph Act, one finds a provision requiring the employment of white laborers in the transportation service by the Government contractors who take mails between the United Kingdom, its colonies and other countries.§

Professions and business :

It is nothing extraordinary that Victoria has such regulations as prohibiting foreigners from engaging in selling and buying of liquor, becoming pilots,¶ jurors and barristers.

As regards the construction and upkeep of electric railway and bus lines in Queensland, no one but those who successfully passed tests are allowed to work according to the Local Authority Act.

However, these professions and businesses are frequently prohibited to foreigners in other countries, though the dealing in liquor is not so common as in the case of others. Perhaps electric lines and bus services are thought to be common carriers and as such are considered to be subject to mobilization in case of emergency. Hence, we venture to surmise that they exclude foreigners. In this Australia is not a single exception. Nor is there any special interest from the point of view of our study.

Claims to public funds :

Foreigners are not entitled to receive the invalid and old age pension funds. In the case of Asiatics, even those who have legally become Australians by naturalization or marriage are not allowed any claim to such funds. That Asiatics alone are not granted any industry encouragement funds is not a surprise. But when it comes to the point where they limit the granting of subsidy to only those factories in raw cotton, fabrics, vegetation materials, rice, rubber, coffee, tobacco, fish canning, fruit, wool, top, pulp, employing white laborers, discrimination has no explanation or excuse. It is no more or less than defying the law of human existence and of one's right to obtain his livelihood.

According to the State Advance Act only those who have passed the dictation test are eligible to the Government subsidy.

The disposition of public funds is usually considered to be an autonomous act and foreigners are not allowed to take part. But the enjoyment of insurance and pension funds are now quite unanimously recognized as the privilege belonging to all who contributed to them, foreigners not excluded. Such tendencies have found expressions in international conferences and conventions. When Asiatics are discriminated against even after attaining the same national status as fellow Australians, then, it must be said to be discrimination at its worst.

Factories and Factory Workers :

Chinese and other Asiatics in West Australia cannot become the proprietors or occupants of a factory unless they can prove to the Minister in charge that they were already engaged in the work at a stated factory prior to 1903. As regards the Asiatic laborers in these factories, unless the factory owners can prove to the factory inspectors that the Oriental workers were already employed prior to November 1, 1903, they are not allowed to work. The factories above referred to are those buildings and establishments having more than four people for the purpose of manual work or conducting

sales. Further, it is understood that the same regulation applies in a factory where even one Chinese or any other Asiatic is employed.**

One more discriminatory treatment, and this, in Queensland, might be added. Those other than Europeans and Australian natives are not allowed to work in oleomargarine factories unless they have passed the dictation test, which is well nigh impossible for Asiatics; therein lies the real purpose of the test.

Thus, Oriental laborers are absolutely prohibited. Every conceivable means has been devised to curb their activities even of those who are already there. The pearling laborers are not allowed to enter. They are only permitted to labor in such a place, under such conditions and for such a period as indentured laborers. If for any reason,—and reasons are many and not necessarily bilateral—a Japanese pearler is stamped as an "undesirable" he is liable to be subjected, at any time, to the dictation test for the obvious purpose. It is true, to be sure, that all immigrants are subject to the test for the period of three years after their entrance, and, in case of failure, to deportation.

Granting that Australia is not the only nation that prohibits immigrant laborers, we are yet unable to reconcile ourselves with the present status of her arrangement of not allowing Japanese merchants to establish themselves as permanent residents. They are only allowed to stay for a one year period at a time, though it is renewable as a matter of practice, but with accompanying handicaps and instability.‡‡ Neither does it seem exactly just when the laborers, who are already there, are not allowed to change their status without depositing a bond of £100, which privilege is seldom granted.§§

As exemplified by these few examples, the impatient and active Australian frontiersmen could have been far more expressive and original in the demonstrations toward outsiders, especially toward Orientals, were it not for Japan's self-restraint and for their noble heritage of justice and square dealing handed down from their Anglo-Saxon ancestry. The part played by the United Kingdom as leader of the British Group has been to minimize as far as possible this friction, by insisting that the Dominions should exercise their unquestioned rights in such a way as to give the least offense and hurt to the peoples of India, of China, and of Japan. This great question of foreign policy has occupied that attention of most of the Imperial Conferences since 1897.

Naturally in this we cannot say that Britain is altogether impersonally inclined to all doings and feelings of her frontiers, particularly when she herself expects to direct her own emigrants to these remote colonies. Nevertheless, she has exercised a wholesome influence, not alone through her Governmental channels, but also through her well trained scholars and men of affairs. For instance, although licensed professions are usually closed to foreigners, on November 27, 1922, the British Medical Association passed a resolution recognizing the high standing of the Japanese physicians.¶¶

Temporarily discouraging but in the long run an encouraging feature about the exclusive attitude of Australia is that it originates partly as an expression of pro-British sentiment and not necessarily as that of the anti-Asiatic feeling. It is not altogether the question of "white" Australia but rather a matter of "high-standard-of-living" Australia. In this last sense her Oriental problems are no different from those in any other country, without that intense rival nationalism to entangle the situation.

It is discouraging because the Australian Trade Unions are so well organized and politically so powerful that they force questionable practices upon the whole nation. In connection, for instance, with the Compensation Act above referred to, no one may institute a claim or claim a benefit except through these unions. Such a channel is not open to Orientals who are excluded from the

*The Lease to Alien Act, 1912.

†Gaimusho; Op. Cit., pp. 17-8.

‡Ibid., p. 96.

§Ibid., p. 97.

¶The Marine Act, 1915.

¶¶Gaimusho, Op. Cit., p. 97. These articles vary from year to year.

**The Factory and Shops Act.

‡‡Cf. Japanese National Committee of the International Chamber of Commerce; Proposal of the Japanese National Committee Regarding Trade Barriers, p. 29.

§§Gaimusho; Conditions of the Japanese Pearling Laborers in Australia, pp. 20-1.

¶¶Hall; Op. Cit., p. 139.

¶¶Cf. Gaimusho; Op. Cit., p. 80.

membership in them. In America the labor opposition to Orientals is not now as strong as it once was, partly because of its realization of the universality of its problems and its common interests with labor elements of other nations.

But we are not necessarily disheartened, because we are bound to enter into a new régime of world economy in contradistinction to national economy which has been in vogue heretofore. A freer circulation of goods, capital and labor is coming faster than we think.* This is so well illustrated by New Zealand which concluded an arrangement with Japan on July 24, 1928,† prompted largely by her commercial interests, whereas, she chose to remain aloof for a long time without taking any share of the benefit from the British-Japanese Treaty of 1894 as well as of 1911. A double approach is thus open; on the one hand, the realization of ever closer economic interdependence, and on the other the rise of economic wellbeing in industrial nations like Japan, which undoubtedly will contribute much toward the solution of the problem.

South Africa and Orientals‡

The facts about the treatment of the Oriental people in South Africa are little known in Japan. Since this area belongs to extra-Pacific regions, its problems do not exactly come within the purview of our study. However, they are no different from those of other frontier countries of the West where new people are improvising nationality. Therefore, a glance at these questions may possibly afford us a few examples of a common basis and similarity.

The anti-Asiatic feeling of South Africa dates back about forty-five years. A reading test in English was the first restrictive measure ever introduced in this extreme south, the Natal Colony, which is famous for its sugar plantations. Finding that ordinary African colored laborers were not satisfactory, she introduced some Indian contract workers. But to the disappointment of the people of this colony, the Indians were primarily merchants and not laborers. Upon the expiration of their contract, all went into small retail business, in which they prospered. In the economic competition the usual Gresham's law operated and they outsold the Natal merchants, which led to the now famous Natal Act against further entrance of the Indians.§

It is not to be understood, however, that this restrictive device is any different a phenomenon from that of any other inter-group contact. Originally the contest in its vertical and political sense was between Dutch and British descendants, as it was between the French and British in Canada. This contest did not stop them from importing the East Indians, when laborers were needed for their plantations. But as has already been stated the Hindoos, to their disappointment, were essentially commercial in their inclination. The discovery of diamonds in the Kin Valley and gold in Johannesburg necessitated the introduction of efficient laborers, and, at the same time, prompted the migration of adventurers.

It was then suggested to invite Japanese workers; but they could not be easily induced to migrate to that end of the earth. Hence, about 30,000 Chinese were consequently contracted to go. Their records as permanent emigrants were not as good as might be expected. Then, too, the ill-reputed vanguard which transmigrated from the red-light districts of the Japanese colony of earlier Singapore was destined to retard the desirable relations between South Africa and Japan.

However, during the Great War, South Africa was like any other nation. She would not and could not conveniently demonstrate against any section of her fellow Allies against "Imperialism" and "Autocracy." As the saying goes in Japan, "The moment food passes the throat, one forgets its hotness." As soon as the motive for an allied solidarity disappeared, relaxation, in common with all others, took possession of that nation. The loss of international co-operation was substituted by the rise of reactionary nationalism, nationalism for good or evil.

This narrow nationalism was now directed against the Orientals, though already the majority of Asiatics were native born South Africans, and as such some of them shouldered muskets with other brothers from Cape Town. Hence, the agitation was aimed not so much at the exclusion of Asiatics as it was at their segregation. A bill to that effect was first introduced in 1920 in the Federation Parliament. For four years in succession, the appearance of the bill became an annual event with increasing popularity. In 1925 it almost passed but was prevented by the timely dissolution of Parliament. It was at this juncture that the Japanese Consul

secured a ministerial statement to the effect that the Japanese were not designated by the bill.

Due to the annual agitation against the Asiatics, which, however, in effect was meant to be the Indians, the Government of India offered in 1927 to recall its nationals, for which the South African Government agreed to subsidize £10 per head to those who returned. Although the arrangement was completed and law to that effect was passed, that did not achieve the end sought for. For she hoped to rid herself of the Hindoo economic competition, while the arrangement only enticed the extremely young or the extremely old, who were not at all engaged in the commercial contest, to leave the country. It indeed enabled the burden of the antagonists to be lightened at the expense of the South African taxpayers, as they viewed the situation.¶

On August 20, 1918, the Federal Liquor Law was passed, though already up to that time Orange and Transvaal were made dry by provincial regulations. According to this law, no Oriental could engage in the sale or purchase of liquor or could he be employed in any liquor establishment. While there was no objection to the ostensible aims of the law itself, because of its discriminatory character, Consul Imai again sought legislative interpretation of the law to the effect that Japanese were not included within the meaning of the word, Asiatics. Therefore, a strange irony played its tricks, for heretofore no Asiatic was allowed to indulge in liquor in those two states above referred to. But because of the new interpretation, since the Union law went into effect Japanese have been newly allowed to freely enjoy the article prohibited to other Oriental peoples.¶

As regards the right of suffrage, it is still left as a matter of provincial choice. In Cape Colony, for instance, Asiatic people enjoy the right to vote by birth as well as naturalization. There are 300,000 Malaysians who exercise the right of suffrage. But their right is limited to voting only and they enjoy no right to become candidates for office. It is interesting to note that in these legislative limitations, the Jews, or the Japanese are not included among the "Asiatics." So far as the Japanese are concerned, their status was uncertain, varying at different locations and different times. But thanks to the vigilant efforts of Consul Imai, they are almost always exempted from the operation of these rules.

For many years the Japanese people have entertained a mixed sentiment of disappointment and doubt in the South African situation. For there exists no treaty between that country and Japan, although our consulate has long been established there with usual privileges and immunities. Hence, even now no Japanese is allowed legally to reside there, yet they are allowed only as temporary tourists. They possess no freedom of residence nor are their leases recognized.

It is for these reasons that in connection with the Conference of the International Chamber of Commerce at Amsterdam in 1927 where a discussion upon trade barriers took place, that the Japan Federation of the Chambers of Commerce and Industry asked that the following item be put on the agenda:

"Regarding the improvement of the treatment of Japanese in the Union of South Africa."

The following was the accompanying explanation for the above proposition:

"The economic relations between The Union of South Africa and Japan have become increasingly intimate, and our mutual trade as well as the Japanese ships that call at the African ports become more and more each year.

"For instance, while the trade between these two countries in 1922 was only £784,000 it jumped to £1,200,000 in 1926, and the imports to that country from Japan ranked fifth among the nations of the world.

"Thus, in spite of the increasingly intimate economic relations between these two countries, the Japanese are classed among the prohibited immigrants and enjoy no freedom of

*The writer still holds the same view in spite of the present manifestations of economic nationalism, which he believes is a temporary phenomenon.

†Cf. Appendix No. 68.

‡Author owes much of his information regarding South Africa to Consul T. Imai of Cape Town.

This is quite natural. For according to the Gaimusho figures of the Japanese abroad for 1927, there were only 18 in South Africa and 12 in East Africa.

§Imai, J.; Concerning the Conditions in South Africa, pp. 14-15.

¶Ibid; p. 21.

¶Ibid; p. 24.

residence nor is their lease of real property recognized, thus inconveniencing greatly the trade between these two nations. We consider, therefore, that the removal of such restrictions is imperative to the amicable development of international trade."*

It is to be added that Japanese were allowed to stay in the country only for six months at a time. In order to prolong their stay they had to petition the Government for renewals.† Naturally, we are in perfect accord with the general aims of the proposition. For in these days of world unity and solidarity, there is absolutely no excuse for the policies still pursued by the African Commonwealth. Japan can do nothing with a nation with whom she has no treaty. She can do less by any agitation through a third party agency, especially in this reprimanding form of singling out a nation, for the satisfaction of another single nation, in an international voluntary organization.

Resolutions in an international conference should aim at general principles for a universal application. If South Africa is not inclined to accept our trade and friendship, our conscience is clear. We have no apology to make before an enlightened community of civilized nations. We shall merely point out that together we struggled for four years in order to establish a better world, freer world to trade and live in. Our Treaty of Peace, League Covenant and recent conventions are all for a decidedly equitable and equal treatment of one another, at least in the field of commerce and industry.

The world no longer knows an absolutely isolated country. Bound by a treaty or no, nations can no longer pursue a solitary existence: it is a unit of an interdependent society and a member of a moral organism. It is hoped that our businessmen can organize the African-Japanese trade on a more mutually beneficial basis, and that our South African colleagues will see no legitimate reason, for not taking her full share of international co-operation, in time of peace as well as of war.

East Africa and Asiatics‡

The Oriental problem in East Africa is somewhat different so far as Japanese are concerned, for it is a triangular question among the British, Indians and natives, in which the last named have no voice. It is primarily a matter of the colonial policy of the British Empire being influenced, as elsewhere, by the claims and interests of local colonists. Dr. Ujiro Oyama, who investigated the commercial possibilities between Japan and the East African colonies, has given an interesting account of the situation. But inasmuch as our interests there in this triangular difficulty are indirect, we shall be satisfied with but a few remarks.

So far as Kenya is concerned, the British occupied it in the middle of the nineteenth century, prompted by benevolent missionary desire. Its apparent objective was to enlighten it and make it the prosperous Kenya of the natives and incidentally make it a desirable source of British trade. However, if Sir Charles Eliot, who was the Governor of the colony (1901-4) was reflecting the attitude of his Government, it was an exact duplication of that of the early American colonists in relation to their aboriginal Indians. The colonial masters held that the backward people were not to monopolize the rich resources unused, and that it devolves on them as their providential mission to exploit the new land, which originally was thought to be of no value.

With that end in view the Government rearranged the habitations of the natives and designated their reservations. As a col-
lorary to this, the Governor opened the fertile high plateau for the settlement of Europeans and encouraged the immigration of Britishers. It was at this stage the Oriental problem made its first appearance. For in order to assure the priority of Europeans, Asiatics were excluded in 1906 from the newly opened area.

The reason assigned for this action was the protection of the natives. Since then several anti-Asiatic measures have been introduced. But due to the strenuous objection from the Indian Government, they have not been placed on the statute books. They have taken different forms at different times including the proposals of segregation and prohibition of Oriental immigration.

In 1923 when a serious controversy arose between the Colony and India, it was claimed by the East African Government that it was primarily the question of Africa for Africans, and if the interests of the natives and immigrants were to conflict, those of the former must prevail. It has its force of argument. But as

a matter of fact the conflict in question was between those of the immigrants from Europe and India, the majority of whom were the members of the same Empire.

In response to a strong protest from the Indian Government, the British Colonial Office made a statement which said in part:

"Only in extreme circumstances could His Majesty's Government contemplate legislation designed to exclude from a British Colony immigrants from any other part of the British Empire. Such racial discrimination in immigration regulations, whether specific or implied, would not be in accord with the general policy of His Majesty's Government! . . . But immigration would be restricted for economic reasons in order to protect the African natives."§

Now there has been arranged a sort of "gentlemen's agreement" between East Africa and India. No law exists prohibiting the Asiatics as such from purchasing land or landed interest. But each real estate transaction must receive the Governmental sanction which is not forthcoming in case the "party of the second part" happens to be an Asiatic.

Neither are there any discriminatory immigration laws against the Asiatics as such in other East African Colonies such as Tanganyika or Uganda. But how they shall apply their immigration prohibitory provision, "Those who are recognized as undesirables" will be of great interest. We shall watch with especial and keen interest the immigration development in the Tanganyika Mandated Territory which was accepted by the British Empire to govern it to "the sacred trust of civilization."

Conclusion

These discriminatory regulations are quite annoying and a source of humiliation to the peoples of the Orient. In these days of increasing international relationships and world organism, it must be admitted that society can only advance through the recognition and application of international fairness and justice. Unfair and unjust discrimination is not to be justified much less to be encouraged, although it may be necessary to overlook or tolerate it temporarily; for reality cannot be ignored though ideals must not be forgotten.

So our answer to Mr. Albert Johnson is this: The situation in the British Empire is somewhat different from that of his country. While it must be observed that all of the self-governing British Dominions and Colonies actually discriminate against the Oriental peoples such discrimination has operated with less offense as a matter of practice. Because:

First, it was, in a measure, offset by the fairness, dexterity and consideration displayed in the dealings of Great Britain with Japan.

Second, the interests involved in the discriminations within the British Empire are or rather have been insignificant as compared with those between America and Japan.

Third, none of these British Colonies adhered to the British-Japanese treaties except Canada which concluded her special arrangements with Japan, and which were on the whole strictly observed on both sides. Japan can hardly protest seriously to the countries with which she has no formal treaties even though her own people were discriminated against. For diplomatic machinery can only be brought to play successfully where there is a legal claim.

Fourth, the Colonies and Dominions have always sought a prior understanding through the Governments concerned. Moreover, they have never failed to take Japan into their confidence, and have enlisted her co-operation.

Lastly, because of distance and remoteness in interests between our country and the British Colonies and Dominions the question of national rivalry never entered into their relationships. Hence, the difficulties could be checked within reason, which has no control over nationalism. Nor do we look there for any peculiar freak

(Continued on page 489)

*Liberal translation by the "International Gleanings from Japan," Feb. 28, 1929.

†Cf. Japanese National Committee of the International Chamber of Commerce; *Op. Cit.* p. 29.

‡The author acknowledges much of his information to Dr. U. Oyama in his report to Gaimusho, "The Condition of British East Africa."

§Buell, Raymond L.; quoted from "Indians in Kenya" *Parl. Pap.* (1923) Cmd., 1922.

Japan's Foreign Policy*

By Lieut.-Col. H. ST. CLAIR SMALLWOOD, F.R.G.S.

THE intended withdrawal of Japan from the League of Nations in 1935 does not render her foreign policy less interesting or less important to the rest of the world.

Although a section of the English Press writes of the possibility of war between Japan and America, there is little that either country would have to gain, and very much to lose, by recourse to war. It is sometimes little realized in England that Japan is one of America's best customers and that America is in the same position *vis-à-vis* Japan. America's export of raw cotton to Japan and Japan's raw silk exports to America are two very cogent reasons against war between the two countries. The League of Nations exists to prevent war, but self-interest is also a valuable war-preventative. It is no doubt possible that both these countries might place their raw material elsewhere, but in these days of the world's undigested bounty of raw materials markets are not easy to find.

When considering Japan's foreign policy one must look at those countries where she is best able to market her manufactured goods. One of the direct results of penning Japan within her own frontiers is the menacing of markets previously held by our own and other manufacturing countries.

Let us consider dispassionately Japan's situation. She has a rapidly increasing population in her small island empire. Her population increases at the somewhat alarming rate of about a million a year. She looks westward to America; the door is closed. She looks southward to the sparsely populated wastes of Northern Australia; she finds no welcome in either quarter. In whatever direction she looks there is either an excess of population or there is a prejudice against her immigration. How often have I heard it said that Japan's demand for increased opportunity of emigration is met by the existence of Manchuria? But how far is this from the truth when one realizes that there are only a quarter of a million Japanese in the whole area of Manchoukuo, and in a population of over thirty millions of people? True there are three-quarters of a million Koreans who are Japanese subjects, but who have come from Korea and not from overcrowded Japan. Korea absorbs but few Japanese; the same thing applies to Formosa and to the Marshall Islands. It is to mass emigration that Japan would have to look for any serious relief from her troubles of over-population. Manchoukuo is closed to her mass immigration by the vast numbers of Chinese agriculturists who, with their lower standard of living, making it impossible for the Japanese agricultural classes to emigrate to Manchuria. It is only from these agricultural classes that emigration in any numbers can be expected. The penetration of the Japanese into other Eastern countries is largely analogous to British penetration into India, Burma, Ceylon, and the Straits Settlements: British emigration is confined to the governing and commercial classes. You do not see British porters on Chowringhee in Calcutta, nor working on the land for Zemindars; neither do you see Japanese coolies on the Bund at Shanghai or Japanese cultivators in Chinese fields. It is unlikely that this situation will change for a good many years. Societies exist in Japan, chiefly in military circles, for the encouragement of emigration to Manchoukuo, but as yet with little practical result. A certain number of Japanese rice farmers have gone to Manchoukuo, but it is difficult for them to work alongside Koreans on equal terms.

The turning inwards of Japan's emigration stream has therefore resulted in industrialization and super-industrialization, and the very countries which have blocked Japan's immigration, rightly or wrongly, are now faced with the keen, even cut-throat, competition resulting on this industrialization. Idle looms in Lancashire follow in the wake of Japanese competition. Japan buys India's short staple cotton which is not suited to Lancashire mills and ships it back to India in the form of cotton textiles. For several years, until 1932, India had a favorable trade balance with Japan, but in 1932 the balance swung from a favorable one of twenty-two million yen to an adverse one of seventy-five million yen. As recently as 1925 there was a balance favorable to India of four hundred million yen. This rapid decline has alarmed the Indian Government so much that it has abrogated the Indo-Japanese Commercial Convention of 1904. This has caused very

hard feeling between the Japanese and Indian Governments, also between Japan and Britain. Japan complains about discrimination and the Japanese Cotton Spinners' Association demands a boycott of Indian cotton. This latter step would be serious for India in that Japan's purchases amounted to one hundred and thirteen million yen in 1931 and ninety-one million yen in 1932. It is suggested that this boycott of Indian cotton is to be replaced by bigger purchases from America.

The reasons for Japan's success in the cotton textile markets of the world, particularly in the East, are not far to seek. Namely, her low scale of factory wages, compared with those of Great Britain and other manufacturing countries, allied with the depreciated yen. In addition, of course, British shipments to the East suffer under the high Suez Canal dues, whereas Japanese shipments go all over the East in their own bottoms and free of any Canal imposts. I have stressed this cotton question as Japan's foreign policy is likely to be shaped, *vis-à-vis* Great Britain, by her economic interests in the world's cotton textile markets. There are already suggestions that she should buy her wheat and wool from outside the British Empire as a retaliatory measure for the abrogation of the Indo-Japanese Commercial Convention. Simla, it is devoutly to be hoped, will find some *modus operandi* and will successfully initiate some sharing of markets and some means of avoiding the hard feeling which exists at present. There is no doubt in my mind that Japan still cherishes a deep friendship for Great Britain as her former ally. Despite strained relations which have arisen owing to the abandonment of the Anglo-Japanese Alliance in deference to American sentiment, the construction of the Singapore base, the sympathy extended to China, and the lack of it to Japan, in the disagreement between those two countries, the keen competition in Eastern textile and electrical markets, the adverse vote at the League of Nations—in spite of all these I feel there is common ground between the two nations and that the rift separating them can be bridged with goodwill on both sides.

The countries with which Japan's foreign policy is chiefly concerned are China, Russia, America, and Great Britain. I have dealt with her policy with my own country, which mostly has to deal with commercial questions, though there may be questions arising sometimes in China owing to the large interests that both countries have there; these are usually capable of local adjustment.

With Russia in the recent past there has been the nervousness engendered by Japan's fear of Bolshevism and a few incidents chiefly connected with the Chinese Eastern Railway. Negotiations now proceeding will probably result in the Chinese Eastern Railway becoming the property of the Manchoukuo Government or the South Manchurian Railway. This will probably remove the most fruitful source of friction. One of the results of these negotiations will be that Vladivostok as the terminus only of the Ussuri-Amur Railway will lose its importance and South Manchurian and Korean ports gain correspondingly. It is reasonable to expect that the wide gauge of the Chinese Eastern will be altered to conform to the standard gauge of the South Manchurian lines. It is also likely that Harbin will become less Russian and more Japanese. Land purchases by Japanese in Harbin have been made for some time past. Perhaps the foregoing may be rather outside Japanese foreign policy, but they may be amongst the results of Japan's influence on the Government of Manchoukuo. If Japan's interest increases in Manchoukuo one feels she will regard with complacency the downward thrust of Soviet Russia into Mongolia and Chinese Turkestan.

Japan's policy in China is surely one of peace; she cannot regard with indifference the loss of her markets there. True these have been largely replaced by her successful penetration into other Eastern spheres, particularly India and the Dutch Indies, but China's four hundred millions of people, with their immense potential purchasing power, must be ever present in the mind of commercial Japan. Peoples cannot be forced to purchase goods presented to them on the end of a bayonet, and trade must follow the flag of friendship rather than the flag of war. There is in China a

*The Asiatic Review.

movement to bring about a cessation of the strained relations between the two countries, and when these efforts bear fruit Japanese trade will no doubt revive in China proper. A suggestion has been made that Japan is prepared to give up her extra-territorial rights in exchange for a guaranteed ending of the boycott. If this happens it might create an awkward situation for those Powers who still have extra-territorial rights.

In North China, where many of the inhabitants have relations and friends in Manchoukuo, the enmity for Japan is giving way to understanding and an appreciation of the more settled conditions obtaining in that country. This feeling may be gradually extending to the center and south of China, but it must be remembered that for the Kuomintang to stretch out the hand of friendship to Japan would involve a violent change of policy and consequent loss of face. I have no doubt that there is a section of the Nanking Government who would welcome a *rapprochement* with Japan, and which Japan urgently desires, but as against this there is a political group which maintains itself in power by appealing to the patriotism and anti-Japanese feelings of the people; also there are professional propagandists and employees of the anti-Japanese boycott movement. Japan's policy is to arrive at a peaceful solution of their disagreements with China by direct negotiation. It has long been my view that "assistance" rendered in negotiations between these two peoples is a hindrance rather than a help. These two great Oriental peoples can surely more easily understand each other better than can we Westerners.

There is no doubt that Japan means to uphold the independence of Manchoukuo. Though it has so far failed to absorb Japan's surplus population, it certainly continues to supply Japan with the essential raw materials of coal, iron, and soya. With regard to the latter, it is well-known that Japan's rice fields and mulberry trees need the fertilizing which they get from the residues from the soya bean oil presses, but a new situation has arisen recently. An increasing amount of soya beans is exported to Germany and re-exported to Japan in the form of fertilizer. This has resulted in a falling off in the direct export of soya bean cake to Japan and a glut of that commodity in Manchoukuo. In time, no doubt, Japan will treat this cake herself, but for the present the trade is almost entirely in German hands. The development of the manufacturing of soya flour may relieve the situation, but for the time being it is becoming increasingly difficult for Japan to absorb the soya production of Manchoukuo.

Mr. Hirohito, the new Foreign Minister, the other day announced in no uncertain terms that Japan had no intention of lessening her interests in Manchoukuo, and this is easy to believe when one remembers the enormous effort, expressed in terms of money and lives, that she has made in that country. Any settlement with China must of necessity recognize this. Japan has made an immense effort to get rid of the bandit element in Manchoukuo, and there is no doubt that she has been partially successful. Manchuria has always had its bandits, but their ranks have been largely increased by ex-soldiers of Chang Hsueh-liang, and from other armies. Bandit control is by no means easy in Manchoukuo, and the entire stamping-out of banditry will take some time. A stable government, allied with rehabilitation of bandits who have only become so by stress of circumstance, are the two most likely preventatives of banditry.

There are various stages in this bandit suppression. The first was the defeating and dispersing of the regular troops under such leaders as Ma Chang-shan and Su Ping-wen. This was the task of regular Japanese troops, but that phase may be regarded as at an end. It can be assumed that there were two hundred and fifty to three hundred thousand bandits when Japan began her campaign against them. The elimination of the "soldier bandit," supported by arms and funds from outside Manchoukuo, has to be followed by the suppression of the professional and "part-time" bandit. An important step has been taken in this direction by the forbidding of the planting of kowliang—or millet—near the railways. The construction of many miles of road will necessitate a similar precaution in their neighborhood. To the uninitiated, the growing of kowliang does not appear to have direct relation to bandit suppression, but this grain grows to a height of twelve feet and more, and forms ideal and almost impenetrable cover to wrongdoers who desire to conceal their whereabouts. Granted that the soldier-bandit menace is dealt with, there remains the fifty thousand, possibly increasing to over one hundred thousand in the summer season when the kowliang is high, which can be dealt with by an increasingly efficient force

of police backed up by Manchoukuo troops. True it is that in the background there are Japanese troops scattered throughout the country, but it may be said that bandit suppression is becoming a matter for police rather than military action. As long as bandits are a perpetual menace the general trade of the country is bound to be held up, and the looked-for development of Manchoukuo may await the ending of that menace.

Japan's policy in Manchoukuo was summed up for me the other day by a Japanese official in the words, "Peace and the open door." Peace is most certainly the spear-head of her policy—if such an expression is not a contradiction in terms—but there is an uneasy feeling abroad that the door to trade will be held a little further open to Japan than to other nations. Though Japan has never made any official pronouncement to the effect, it seems probable that business will largely be conducted in Manchoukuo through the Japanese as intermediaries, rather on the compradore system as in China proper. It is, however, difficult to be didactic on this point while the presence of banditry holds up the development of the country and the increase of trade.

In 1935, when the revision of naval pacts must come up for consideration, there is no doubt that Japan will voice her dissatisfaction with the ratio of 5-5-3. How America will view the naval parity proposals that Japan is likely to make, it is difficult to say, but it is reasonable to suppose that naval parity is likely to meet with less opposition in England than in America. America may look forward with uneasiness to the time when she abandons the Philippine Islands to Philippine self-government, but it appears clear that Japan will be content with nothing less than parity.

Japan's policy with relation to the mandated islands is quite firm in that she contends the mandates were given to her by the Treaty of Versailles and were only confirmed by the League of Nations. It is by no means certain that the League contemplates a change or removal of mandate, but it is certain that any such *démarche* on the part of the League will be strenuously resisted by Japan, who will contend that her mandate can only be terminated by a revision of the Treaty of Versailles. It is not easy to foretell what the attitude of the League will be to a mandatory country which ceases to be a member, as will be the case with Japan in 1935.

It may be said in conclusion that the more one studies the foreign policy of Japan the more reasons there are for believing that her future policy must be a peaceful one. The only way she can keep her teeming industrial millions employed is by devoting her attention to her growing markets. A warlike policy cannot help her in this direction, and her present undoubtedly increasing success in the world's markets is likely to convince her of the extreme importance to the economic life of her country of peace and industry. In order to keep the peace of the world a sympathetic understanding of Japanese difficulties in England is most desirable. Japan's statement of her own case is not always well put. The Japanese are a proud and reticent people: facile speech and easy propaganda are not their strong points. Commercial competition does not oil the wheels of understanding, and the present loss of British markets to the Japanese is bound to make for hard feeling.

The conference in Simla on the subject of Japanese trade in India, it is to be hoped, will result in a reasonable working agreement being arrived at, and one may hope that a policy of mutual forbearance will emerge.

Oriental Immigration in British Colonies and Dominions

(Continued from page 487)

of political circumstances that reduces a gentlemen's agreement to a scrap of paper.

Yet we are far from being satisfied with the present situation of migration relationships between this country and the British Colonies and Dominions, and the treatment of our countrymen in these territories.

We hope that petty and pinpricking discriminations in the British Colonies and Dominions will soon cease. In this we shall look not now so much to Britain as to the Geneva organization, which the Colonies and Dominions have maintained that they would support, to furnish the new inspiration in the solution of difficult problems that lie dormant within the boundaries of these young countries of the West.

A Japanese Talks to America

Mr. T. Shiratori, formerly Chief of Intelligence of the Foreign Office at Tokyo and lately appointed Japanese Minister to Sweden, recently was guest of honor at a gathering of the Japan Society of Seattle and on this occasion he made a noteworthy address dealing with American relations in the Pacific. This address is given in the following:

ABOUT the Manchurian Affair all that has to be said on our side has been said with more or less effect in this country as well as elsewhere. Suffice it to say that the State of Manchuria or Manchoukuo is an accomplished fact, we at least regard the matter in that light. What is now of importance is not the manner in which it was called into being, quite justifiable as we believe it to be, but the question now is whether the New State is going to make good. The present indications are that it will, that it has come to stay. Already, the people in that territory, mostly Chinese, are faring incomparably better than they did under the former régime. State finances have been placed on a sound basis, trade and commerce are prospering as never before; peace and order have been completely restored, there being much fewer bandits than before even in the remotest regions. Altogether, Manchuria to-day presents a very striking contrast to China Proper.

Japan has spent hundreds of millions of Yen and has lost thousands of lives in bringing forth this satisfactory state of affairs. She will have to continue making sacrifices for some time. What has she gained in return? Little beyond what was her due by treaty and otherwise. Had there been good government in Manchuria, able and ready to protect Japan's interests, she would have been spared all these sacrifices and the storm of censure heaped upon her by the outside world.

In face of these facts, these unmistakable facts, it is time that the world began to take a different view of the whole affair. I am confident that in this case, as in many others, the end will have justified the means. At any rate, I cannot bring myself to believe that the Manchurian Affair will really stand in the way of an amicable relationship between our two countries.

Nor do I think that Japan and America ought in any way to disagree about policy in regard to China Proper. America's main concern about China is for the open door. We are as much interested as, nay even more so than, America in the principle of open door and equal opportunity in China, for the China market is indispensable to us. So in this respect we are perfectly in accord and, in fact, Japan and America are two countries which have in the past shown more energy than any other country in their endeavors to maintain that principle.

It is true that Japan's interest in China goes much deeper than the needs of trade and commerce. Japan and China are such close neighbors, and they are so intimately bound up together politically, economically and socially that whatever affects the one affects the other. Suppose, for instance, that China were to fall into the hands of some strong military nation? That would mean a formidable potential enemy at our door. Again, if China were given up to the plague of communism, Japan would be swept away by the same evil. Our interest in China is, therefore, political as well as economic. Our position *vis-à-vis* China is not unlike that of the United States towards Latin America. We have, however, infinitely more reason for concern about China than America has about the Central and South American countries. The country has been torn by civil strife. A vast portion of the land has been placed under communist rule which is spreading like wild fire. Lives and properties of foreign residents are daily exposed to danger which might easily invite armed intervention by some country or other.

In the face of such a situation, it would take much more courage than was shown by President Monroe were Japan to commit itself to a policy similar to that proclaimed by him. Declaration or no declaration, however, the Japanese people feel that they are destined to play the same rôle in their part of the world as America does in hers. They feel that they are capable of discharging their mission as conscientiously as America does hers. I know that after Manchuria and Shanghai such a statement from a Japanese is very unpopular in this country. But I must

request you to ponder more deeply and see if you cannot show more generosity. Call a man a thief and he will steal. Treat him like a hero, and he will act greatly. Why don't you, why does not the world trust Japan and place the responsibility upon her shoulders for the peace of the Far East? We have time and again expressed willingness to assume such a responsibility. We even staked our very existence in fighting a powerful nation to safeguard that peace and to discharge that responsibility. You cheered us then. Why do you frown upon us now when we fight chaos in China in order to put an end to the internal menace to the peace of the Far East?

I know that you are somewhat puzzled at my speaking of these things before you when you have all but forgotten Manchuria and China. It is simply because China has now become an obsession with Japan. We cannot speak of our foreign relations without speaking of China. We cannot think of our relationship with America without thinking of America's attitude toward our China policy. Japan has done nothing in the past on the continent of Asia of which the people and Government of America did not approve. Upon the annexation of Korea by Japan, America quickly withdrew her legation at Seoul to express her acquiescence in the arrangement. The set of treaties emanating from the famous 21 Demands of 1915 had likewise the approval of the Wilson administration, Japan having dropped all the items in the demands to which Mr. Bryan had raised objection. In the past Japan responded with alacrity to every desire expressed by the United States. About Manchuria, for the first time since the days of Commodore Perry, Japan has decided to go her own way in spite of American remonstrances. Is it because we have ceased to value the long standing friendship of America? By no means. America's good-will and her good opinion are as valuable to us to-day as they ever were. If, in spite of that, Japan had to choose the course she did, I think we are not asking you too much when we request you to go beyond the surface of things and try to grasp the true significance to Japan of the China situation. You will then find that after all Japan has done nothing, will do nothing, in China which Americans cannot in conscience approve. I am not saying this in any carping spirit. I have only been giving vent, before friends of Japan, to my inmost thought and hope.

I do not ask you to take me at my word, but allow me to say that a nation with Japan's sense of honor and her clean record in the past cannot have done anything very wrong, all surface evidence to the contrary notwithstanding. Time will reveal to you the entire Far Eastern situation in its true perspective. A question of more immediate concern to Japan and America, although of far less importance than the China question, is that of Japanese emigration to America. Nothing has recently so cheered the hearts of America's friends in Japan as the report that the movement was newly set afoot in this country for the amendment of the Emigration Act. Of course this is essentially an American question about which we Japanese have little right to say anything. No matter whether it succeeds or not, the people of Japan are gratified at the thought that the movement has the support of a considerable section of public opinion in America. With us Japanese, the whole question of emigration is one of sentiment.

The Japanese Government have long abandoned any idea of sending more emigrants to this country. The utmost we request of America is that those Japanese who are lawfully here should be treated fairly. We know that they are. We do not ask for any increase of the number of yearly new comers. Our sole complaint is about the insinuation back of the Emigration Act. That being the case, I, for one, am of the opinion that the remedy need not necessarily be sought in the amendment of the Act itself, most simple and effective as the method seems to be. To my mind, America made a mistake at Versailles when she turned down Japan's proposal for the adoption by the League of Nations of the principle of racial equality. If America had accepted that principle, the clause in question in the Emigration Act would have been deprived of its sting for Japan. It is difficult for the Japanese to understand why America, whose Constitution is based

on the proposition that all men are created equal,—I say it is difficult for us to see why America should have hesitated to subscribe to the principle that all races of men are created equal. It would not have entailed upon this country the least obligation in regard to the racial question of emigration which is admittedly a purely domestic affair in every country. Might I not then venture to suggest that the emigration question in so far as it is a question at all between Japan and America, may on some fit occasion in the future be smoothed over along some such broad line as I have just referred to!

Geneva Like Social Club

Difference Is Members Do Not Have To Resign Even When They Fail To Pay Their Dues

By **STEPHANE LAUZANNE**, *Editor-in-Chief of Le Matin in the Mainichi-Nichi Nichi*

THE League of Nations has often been compared to a big international club, where members meet, chat, exchange views on current topics, and occasionally transact some business. But there is at least one difference between the League and a club: namely, that a rather important number of members omit to pay their dues.

In an ordinary club, it would lead to the polite request to tender their resignations. In Geneva, it does not involve them in any other trouble than to have their names put down on a list—the list of the bad payers.

Here is the list, as published in the annual report of the Secretary of the League for 1933:—

| States | (Balances due) |
|---------------------|--------------------|
| Albania | 29,561 gold francs |
| Bolivia | 910,794 |
| Chile | 443,809 |
| Columbia | 43,408 |
| Cuba | 311,654 |
| Santo Domingo | 24,932 |
| Guatemala | 84,022 |
| Haiti | 28,636 |
| Honduras | 264,327 |
| Hungary | 64,173 |
| Liberia | 35,012 |
| Nicaragua | 244,842 |
| Panama | 29,940 |
| Paraguay | 112,302 |
| Peru | 2,217,632 |
| Salvador | 30,002 |
| Uruguay | 292,700 |

As far as we are able to make an addition, the list includes 17 names and amounts to a total of five million gold francs (more than two million gold yen). Moreover, the list is not complete. Our old friend China is not registered in it and she should be registered, because she owes the League some nine million gold francs. After endless negotiations, she has agreed to pay 400,000 gold francs yearly, in order to meet her late obligations. The money was handed over last year. Heaven will perhaps allow that the money be handed over again this year!

The amusing fact is that we find in the list the nations who are continually filling up Geneva with the noise of their grievances and their quarrels. Thus, China, the worst payer of the League, is also its pet child. To please her, Japan, who had always scrupulously faced her financial obligations, had to leave the club. To please her again, a so-called health commission will be sent shortly to report on the hygienic conditions prevailing within her territory. If the report concludes that some assistance must be given to China, no doubt the League will ask for such assistance.

Thus also, Hungary is one of the most dissatisfied members of the club. She takes part in every debate, but forgets to take part in the expenses of the debates and owes some 65,000 gold francs to the treasurer. Thus, equally, Paraguay and Bolivia, who appeal to the League when war is threatening them, neglect

to answer the League when peace has been restored and when requested kindly to send their checks. Thus, no doubt we shall soon hear from Cuba: we shall hear from her about her troubles, but of course not about her bill.

There is something more. Not only, in the Geneva Club, do we see the bad payers enjoying the same privileges as the good ones, but we see them obtaining particular honors. For instance, no greater honor could be conferred upon a member of the League than to be appointed member of the Council. The Council is, in fact, the executive government of the League: it has to direct its activities, it has to watch over the strict observance of the Pact, it has to see that the rules are faithfully obeyed. Now, we find among the members of this holy Council at least three that may also be found on the list of the bad payers: China, Guatemala, and Panama.

All three have deliberately violated Article 6 of the Covenant, which says: "Expenses will be supported by members of the League according to the proportion established by the international bureau of the world postal union." Nevertheless, all three are members of the Council. What authority indeed have they to ask other members to comply with other prescriptions of the Covenant? How can they ensure a strict observance of the laws of the club when they give the example of breaking one of these laws themselves?

Some people suggested that the laws should be amended and that a member not having paid his dues, could in no case sit in the Council. This is the minimum required by logic and decency. Otherwise, it would be appropriate to post the following motto on the door of the club: "The less regularly members will pay their dues, the more highly they will be regarded."

Vocational Guidance

AMERICAN Association of Engineers has again justified its classification as the welfare organization of the profession devoted to the amelioration or the eradication of those evils which retard the social and economic advancement of engineers. This association has always concerned itself with the human rather than the technical side of engineering. That is why so much color and interest characterizes the campaigns they formulate and direct. Several years ago they resorted to direct action against dishonest trade and correspondence schools that had for years preyed upon ambitious but unsophisticated young people throughout the world, leading them through unethical advertising to believe that a short course pursued at home could fit them for practice of some of the highly specialized callings. Usually these schools guaranteed jobs at minimum salaries on completion of these brief courses. Engineers resented the impression created in the public mind that their profession was one that could be mastered in so brief and perfunctory a manner. It was derogatory to their contention that an engineer rates high esteem and commensurate salary as a member of a learned profession. They objected to glaring advertisements which led the public to believe that a man could qualify for engineering in a few weeks or months of "home study" and to the fact that many men with this kind of training were actually crowding into the lower ranks of the profession, lowering standards of work and compensation. Partly as a defense of professional standards and standing, but largely as a protection for the naive young people who were paying thousands of dollars annually to these "rackets" the American Association of Engineers launched and carried through a nation-wide program of publicity which revealed this kind of graft and made it possible for the better class correspondence and trade schools to organize themselves into a national association to standardize courses establish a code of ethics and put the dishonest schools pretty well out of business through recourse to federal laws concerning the use of the postal service to disseminate false advertising claims.

Now the American Association of Engineers is responsible for the publication of "Vocational Guidance in Engineering Lines," a book which may well prove epochal in pedagogic as well as engineering advancement. Recognizing the presence in the profession of men physically, mentally, or temperamentally unfit for engineering as the root of many professional ills, the Association is again

directing a major campaign for engineering welfare. The engineer-authors of the book have gone smoothly over what has always been their bad hurdle in writing for laymen, for the literary style of "Vocational Guidance in Engineering Lines" is entirely non-technical. Prominent practitioners in every branch of engineering contributed the interesting material. Each man has told simply and non-technically, but entertainingly, precisely what the practice of his branch of engineering entails—not only the nature of the work but the kind of living conditions it requires, the requisite training, the personal qualifications necessary for success, and the probable compensation to be expected. That the book is an authoritative guide for young men about to make the important choice of a life work is indicated by the fact that such men as Charles F. Kettering, Robert Ridgway and L. F. Loree have written the chapters respectively dealing with "Automotive Engineering," "Subway Engineering," and "Railroad Engineering." By comparison with this kind of guidance, most of the text-books now available to youngsters must seem puerile. Practicing engineers will not find anywhere else so concentrated and yet so comprehensive a picture of their profession, for the book covers not only the major branches, but the important specialities that have grown out of recent scientific achievements. For the teachers and deans

charged with the responsibility of aiding students in selection of their life work the volume affords material that no individual or commercial publisher could have assembled except at a prohibitive cost.

All the organizations that assume "big-brother" rôles in the community will discover that this book is a direct method of helping young fellows to succeed. If the engineers are able to develop all its potentialities for good by means of a successful campaign that will put the book in every school and every civic library, the American Bar Association and the American Medical Association may well pursue an identical course in their respective fields.

Just as the campaign which washed out the dishonest schools making unjustifiable claims in training of men for engineering created waves which swept all the other professional shores, "Vocational Guidance in Engineering Lines" may cause all the other professions to make available to experts in vocational guidance material as rich and usable as the engineers have assembled in this very remarkable book.

The price of the book is \$2.50 and it can be ordered through the Association at its Chicago Offices, or through the publishers, The Mack Printing Company, Easton, Pa. The book contains 560 pages, and 50 illustrations.

The Philippine Railway Gets a New Baldwin Locomotive

DURING August of this year, The Baldwin Locomotive Works completed and shipped one Mogul (2-6-0) type locomotive to be used by the Philippine Railway in combination freight and passenger service.

The Philippine Railway owns and operates about 131 miles of 3-ft. 6-in. gauge line in the islands of Panay and Cebu. The Panay section runs north from the port of Iloilo and serves the sugar plantations throughout the center of the island. The Cebu division of the line runs from the port of Cebu, north and south along the eastern coast of the island.

Since 1906, Baldwin has built a total of seventeen locomotives for this railway. Fourteen of these were Moguls for 3-ft. 6-in. gauge and the remaining three were 0-4-0 tank locomotives for a track gauge of 2-ft.

The most recent locomotive, illustrated below, is considerably heavier and more powerful than any locomotives previously built by Baldwin for this railway. The new locomotive has a total weight 46 per cent greater and a tractive force 67 per cent greater than the last previous Mogul, built in 1925. Steam pressure has been raised from 180 to 200 pounds, and the diameter of the driving wheels has been increased from 44-in. to 50-in. The boiler capacity

has been greatly increased to enable the new locomotive to haul heavier loads at higher sustained speeds.

The boiler is of the conventional wagon top type with a firebox designed to burn Philippine lignite. American Security firebrick arch and Elesco type "A" superheater are included. The boiler tubes are welded in the firebox tube sheet.

The locomotive equipment includes—electric headlights and cab lamps; air sanders; hydrostatic lubricator; M. C. B. Automatic couplers; lifting injectors; Westinghouse air brakes, with two 9½-in. air pumps, on all driving and tender wheels.

Steam distribution is effected by means of piston valves eight inches in diameter and Walschaerts valve motion graduated to cut off equally at all points of the stroke.

The Vanderbilt type tender is mounted on two, four-wheeled, center-bearing trucks with cast steel frames. The tank capacity is 4,000 U.S. gallons and the fuel space holds eight tons.

The locomotive and tender are painted black with the lettering, numbering and striping in yellow. Cylinder head and valve chest head covers, also the guides, connecting rods and motion work are polished steel.



A Mogul (2-6-0) Type Locomotive Recently Completed at the Baldwin Works

| | | | | | | | |
|------------------------|-----------|----------------------------------|---------------|---|-------------|------------------------|-----------------------|
| Track gauge | 3' 6" | Grate area | 18.1 sq. ft. | Wheel base, total engine and tender | 50' 9" | Tank capacity | 4,000 U.S. gal. |
| Cylinders | 17" x 24" | Heating surface | 1,068 sq. ft. | Weight on drivers | 96,200 lb. | Coal capacity | 8 tons |
| Drivers, diam. | 50" | Superheating surface | 220 sq. ft. | Weight, total engine | 113,600 lb. | Tractive force | 23,600 lb. |
| Steam pressure | 200 lb. | Wheel base, rigid | 12' 0" | Weight, total engine and tender | 200,600 lb. | Fuel | Philippine lignite |
| Boiler, diam. | 56" | Wheel base, total engine | 19' 10" | | | Service | Passenger and freight |

Dr. Inazo Nitobe

Personal Recollections

By KEN SATO in the Osaka Mainichi

THE present is obviously not an opportune time to reveal in any large degree the inner life of Dr. Nitobe. Every piece of art requires a proper setting for full expression of its beauty and meaning. So great a piece of art as I conceive the life of Dr. Nitobe to be, can be represented with justice only against a proper psychological background.

On the other hand, as he was such a famous man, with a circle of friends and admirers throughout the world, larger than any other Japanese has had, a simple account of his personal traits, character, and ideals would be superfluous because they are known to most people.

It is not my purpose in the present article to attempt to tell the truth about the man's inner sentiments regarding the problems he faced in the evening of his life, nor to recount the great service he rendered his country, which is known to all.

Rather, I am writing this article with intention of sharing with his common friends and admirers the sweetness of reviving in our minds the memory of the noble man who was so gentle and kind.

The name of Dr. Nitobe first entered my consciousness nearly 25 years ago when I happened to obtain a copy of his book in Japanese entitled, "Kigan no Ashi"—meaning reeds which the wild duck brings home from his migration, otherwise mementoes. The book, now out of print, contained many interesting and instructive episodes which had occurred while he was living in the west.

One narrative particularly attracted me—a narrative which I now know to have been characteristic of Dr. Nitobe. It was about a mistake he made in dealing with a little girl. While living in London, it was his pleasure occasionally to visit the home of an English friend and play with his small daughter—Dr. Nitobe was always very fond of children. One day, about to leave London on a short trip and calling upon the friend to say good-bye, he promised the girl to bring her from Paris a doll as large as she. True to his word, he brought a doll which, eager to please the child, he hastened to present to her. The girl looked at the beautiful doll, but then, to the astonishment of Dr. Nitobe and her parents, she seemed disappointed and even refused the gift.

"Why, what is the matter, darling? Aren't you glad to get this beautiful dolly?"

"No," she shook her head. "It isn't my size."

Sign of Greatness

Dr. Nitobe confessed that never in his life had he been so ashamed and mortified as on this embarrassing occasion.

I was deeply impressed by the sensitivity of a man who could be thus affected by such a trifling incident and derive a moral from it.

I had a desire to know more about him—how he looked, how he talked, and so on. When accordingly, several years later in San Francisco—in 1911—I heard he was coming there to deliver a speech, I felt some excitement. I took a seat in the first row so that I might see him at close range.

The man who stood on the platform just above my head, following the introduction of the chairman, was not very different from the sort of person I had imagined: He was of medium height, well built, and of a refined and scholarly appearance. He was then in the prime of life, about 50 years old. His hair and moustache were slightly greying. He wore a pair of glasses with strong lenses.

Comparing his manner on this early occasion with that I came to know after I had associated with him closely, I cannot help smiling. It was a typical one, from which he never changed.

He was to speak about the duties and privileges of the Japanese living in America, but to my surprise he seemed never to get to the point. One after another, he narrated amusing stories and humorous experiences and it seemed as if he had forgotten the

subject of his speech. While speaking, he would walk around the platform hither and thither, sometimes looking up curiously at a corner of the ceiling as if he had found some strange object there, again fixedly looking down at his own feet as if he had discovered something odd about his shoes. His disregard of the audience was conspicuous and it seemed that he was addressing no one, but the atmosphere. Toward the end, he began to play with his watch. And then he connected up the separate anecdotes, fairy tales, and reminiscences which he had told, making them into surprisingly profound moral lessons with a vital bearing on the subject.

After the speech, I wanted to introduce myself, but I felt it impudent for a mere youngster to take such a liberty with so noted a man. I watched with faint envy a large crowd of local celebrities going up to greet him and returned home without shaking hands with him as I had long wished to do. Three years later, when he visited the United States again as an exchange professor, I could have met him if I had tried, but my diffidence again prevented it.

10 Years Ago at Geneva

But I met him at last and became thoroughly acquainted with him—it was at Geneva, 10 years later. Dr. Nitobe had distinguished himself as a great internationalist in the epoch of peace and democracy which followed the World War. He had ascended to the post of Assistant Secretary-General of the League of Nations. I had finished my education in the United States and had gone to Europe to continue my studies. It developed that in a year or so, I went to Geneva to work in the office of the Japanese government's delegation to the International Labor Organization, the League of Nations' sister institution. Meeting Dr. Nitobe then became certain.

One day, soon after my arrival in Geneva, I paid a visit to him at his office. It was a bright morning in the early summer of 1923. The smooth surface of Lake Lemman reflected the distant Alps like a mirror. The League's palace stood on the Quai Wilson overlooking the beautiful lake. Dr. Nitobe's office was on the third floor of the palace, commanding an excellent view of Mont Blanc. When I was ushered in, I caught sight of an elderly gentleman, in genial conversation with a few Americans. He had changed much: his hair had turned silvery and his former restraint and dignity were mellowed to a natural ease.

For the first time in my life I was face to face with the man I had so long revered. He warmly shook hands with me and told me he was very glad to have a new member added to the altogether too small colony of Japanese in Geneva. He asked me how many years I had been away from home and when I replied "Fifteen" he looked at me with surprise.

"Fifteen years away from home!" he exclaimed. "That's a long time: I wouldn't like to be your father or mother, who are thus long separated from their son." He said this with such marked tenderness that it made me feel really sorry for my mother waiting for me at home. At first I experienced some diffidence in the presence of the great man, but this soon disappeared under his paternalistic warmth. When I parted from him, I felt as if I were parting from a friend of long standing, or even something more.

For several months I lived in the same hotel in which Dr. Nitobe stayed—a quiet family hotel in the outskirts of the city, called Beau Sejour. It was my good fortune on fine Sunday mornings or other holidays, to accompany him on his walks around the beautiful vicinity. Imagine the happiness of one enjoying the exclusive company of such a man—and in the bosom of nature! He would gaze at the majestic peaks of the distant Alps and draw inspiration from them. Now and then, he would bend over little wayside grasses and admire their dainty flowers or harken to the warbling of singing birds or the chirping of insects. A lover of

nature to the extent of adoration, he infused his own ecstasy into the heart of his companion. On such occasions, he seemed to have forgotten worldly affairs entirely, and acted with the innocence and simplicity of a child.

When his wife returned from a visit to her home in America, Dr. Nitobe settled with her in a villa in the Jura mountains. I lost interest in hotel life and moved to the house of an aged widow. This Swiss lady lived modestly with her daughter and son and had no definite income. I found that the family had great respect for Dr. Nitobe and talked of him as of a savior. Incidentally, I learned that Dr. Nitobe had been secretly aiding the family, sending the daughter to college and securing the son a position. Later I found that he was performing similar acts of benevolence for a number of other families and persons in need.

I always enjoyed going to parties, where he was present. For in a small social gathering he expanded and became very genial. There was a little round of social events in the Japanese group of a dozen families, and their success was conditional on the presence of Dr. Nitobe. On such occasions, he was not only an object of general love and veneration, but also a source of joy and delight to all.

He had a very human liking for the good things of life and especially enjoyed good Japanese food. He would come to a party with a small bottle of digestive pills and in the midst of a dinner he would produce it from his pocket and tell the host or hostess not to worry about his "excess" in the enjoyment of rare delicacies, for he was armed with an enzyme.

He was an unusually good conversationist and it was at the small dinner party with his intimate friends and admirers that he grew most delightfully talkative.

Quietly and spontaneously and with plenty of humor, he would relate anecdotes and experiences which were invariably amusing and instructive. Often his jocular narratives had very deep meaning. Sometimes what he related as mere episodes in his life, had vital connection with the making of modern Japan.

One Evening at London

I will give an example of the kind of narratives he used to relate on such occasions. One evening, while visiting London on business as the Assistant Secretary-General of the League of Nations, Dr. Nitobe went to hear a popular lecture given by Mr. H. G. Wells. He was the only Oriental present. Prior to the lecture, he spoke to the chairman of the evening and through him was introduced to Mr. Wells. Their meeting was casual. Dr. Nitobe gave his card. Mr. Wells received it and put it in his pocket without carefully reading it. The subject of the evening was "The Progress of the Orient." Incidentally, in discussing Japanese national traits, the speaker referred to Dr. Nitobe's "Bushido" and discussed it somewhat critically as an interpretation of the Japanese spirit. After the lecture, as is the British custom, the chairman requested the members of the audience to raise any questions they wished to ask the speaker. Seeing that no one responded, he stated that there was among the audience a "Chinese" gentleman; and that inasmuch as the topic dealt with was Oriental, a comment from him would be highly appreciated. This made it inevitable for Dr. Nitobe to say something. He rose and said: "I have greatly enjoyed the edifying lecture on the Far East, particularly on Japan, of which I claim to be a humble citizen. I wish to thank Mr. Wells for the enlightening comments he made on 'Bushido,' which is a work of my youthful days."

Dr. Nitobe noticed that on hearing this, Mr. Wells felt in his pocket for the card and quickly glanced at it.

But the incidents in the Geneva days, which I recall with particular pride, are those where Dr. Nitobe shone in the company of great international figures. I often watched him acting as a member or as the chairman of different committees on big international questions, committees in which men like Lord Cecil, Sir Austen Chamberlain, the late Monsieur Aristide Briand, Dr. Gustav Stresemann, and others were present.

In the company of such great men, the figure of Dr. Nitobe seemed to me to grow loftier and to overshadow the rest, as the unpretended leader of them all. He seemed to retain his admirable calm and naturalness while others appeared to be making conscious efforts to impress and to carry their points. The contest between him and the rest was that between a philosopher and statesmen.

When, in the autumn of 1926, I went to see Dr. and Mrs. Nitobe to say good-bye, because I was returning to Japan, they told me that they were also returning to Tokyo the following spring, because Dr. Nitobe's term of service in the League would then expire. Dr. Nitobe obviously enjoyed his life and work in Geneva—he was looked up to in that Mecca of internationalists as one of the most distinguished men there and he was loved and respected by every one who knew him—but like all Japanese, who have been long abroad, he was homesick.

Wins Seat in House of Peers

When he returned to Japan early in the spring of 1927, H.M. the Emperor, in recognition of his meritorious service, appointed him a member of the House of Peers. He was subsequently offered many fine positions with high honors and he chose to become associated with the *Osaka Mainichi* and the *Tokyo Nichi Nichi*, acting as advisory editor.

Through his consequent connection with the English Edition, of which I was a staff member, I was afforded an opportunity to associate with Dr. Nitobe more closely than ever before.

He stayed in Tokyo where, besides his newspaper work, he was engaged in a variety of social, educational, and international activities, which always kept him exceedingly busy. He made it a point, however, to visit Osaka at least once every month for three or four days, looking after the affairs of the *Mainichi*, meeting the members of its staff, etc.

These short visits were a source of joy to him, because in Osaka he was less molested by ceaseless callers than in the capital and also because he had a number of intimate friends and relatives in Kansai.

On the occasion of his monthly journey to Osaka, he usually wrote beforehand to one or two of his friends, giving the time of his arrival. He never liked to cause trouble to others, but he did enjoy being met by a few intimate friends at the station. Above all, he enjoyed meeting the little children of his friends. He had the ability of making himself greatly liked by children. On being greeted by some half dozen little ones at the station or in his hotel, he would chuckle with joy and shake hands with them and pinch their cheeks. He would then let the tiny children surround him and produce from his pockets the little gifts which bring them so much happiness. It was an unsolved puzzle among his friends how he always managed to have about him some little things for children. Only once during the countless occasions when I followed him in visiting different places in Osaka and elsewhere, did I catch sight of him stopping at a toy shop quickly purchasing a few pretty little objects, which he quietly slipped into his pockets.

After Shanghai Parley

In the early summer of 1931, when Dr. Nitobe returned from the conference of the Institute of Pacific Relations, held in Shanghai, he was a man of great "news value." He had gone there despite his illness and despite the rumors of a Chinese plot to assassinate him. The conference dealt largely with the Manchurian issue and proved inevitably a stormy one. Dr. Nitobe had participated in a number of dramatic controversies which had created some sensation in Japan.

When, therefore, the steamer arrived at Kobe, a large number of reporters and camera men went out to the ship to interview him. He willingly consented to tell everything the newspapermen wanted to know. He sat in an arm chair in the ship's saloon and was giving them a highly interesting account of the conference, when a little daughter of a friend ran into the room. Dr. Nitobe noticed her from a distance; then oblivious to what he had been doing, he stood up, walked over to the child and picked her up in his arms. He then turned to the astonished reporters and announced: "Gentlemen, that is all I have to tell you!"

Besides children, there were a few other things of which he was very fond. One of them was theatrical entertainments, particularly modern Japanese dramas. It was his custom on arriving in Osaka, to whisper in my ear smilingly: "Don't forget to spare me an evening for the theater."

Tokyo, of course, is the place for the best theatrical performances, but there Dr. Nitobe very seldom had the leisure to go. The kind of plays he liked best were those dealing with domestic life and social problems. During the comic parts of a drama,

he would laugh like a child, but when a tragedy developed, he seemed to identify himself with the situation and suffer intensely. I often saw him shedding tears.

When a sad act was finished and the curtain fell, he usually drew a sigh of relief, realizing that it was, after all, only a play, and commenced to wipe his glasses.

"The idea!" he would exclaim on such an occasion, "the idea of coming here and spending a lot of money, merely to suffer and cry!"

Last summer he planned to make an extensive tour in Manchuria before attending the Pacific Relations conference at Banff. His friends did not approve of his idea of taking an airplane back and forth to Manchuria, but (nevertheless) he tried it and endured the discomfort of the aerial journey, though the excessive heat and the strenuous trip left him very tired.

Impressed by Henry Pu I

Of his visit to Manchuria, he mentioned to me one incident. He was received by H.E. Henry Pu I and had an interesting conversation with him. He was impressed by the remarkable intelligence of Manchoukuo's chief executive.

The day before he left for Tokyo he made the last visit to my house. It was the birthday of my little boy, whom he had named Sukiya—meaning "I am the plough." When the child was born, on being asked to give a name for him, he had told me: "Your name is Ken which means 'the sword': well, following the Biblical exhortation, why not name your boy 'the plough'?"

The story exemplifies the typical sort of Japanese humor of which Dr. Nitobe was capable. It was the third birthday of "the Plough" that he had come to celebrate. The occasion was a happy one which I shall never forget, but I refrain from describing it because it is too personal. Only, on leaving us he wrote a poem—a Japanese waka—which I take as very significant. It may be literally translated thus:

I think of my country

And I am troubled for mankind;

Therefore I endure all things.

My heart I hope God knows.

Dr. Nitobe fell ill soon after the conference of the Institute of Pacific Relations at Banff was finished. In the conference, as usual, he busied himself day and night, acting as the chairman of committees, delivering a long speech in the plenary session, reading the papers to be printed, attending banquets and other things.

His experience, reputation and versatile personality made it inevitable for him to assume practical leadership not only of the Japanese section of which he was the chairman, but of the entire conference. When the session was over, he was exhausted.

Miss Tsugie Mori, who went with Dr. Nitobe as his secretary, wrote to me soon after he became ill: "Having attended Dr. Nitobe all this while, I know how extremely overworked and fatigued he is. The termination of the conference was to him a great relief and the reaction brought sickness upon him."

On October 13—two days before her husband's death, Mrs. Nitobe wrote:

"Nitobe is pronounced by doctors and nurses to be a 'wonderful patient' and I can testify to this. In his extreme weakness he has, at times, seemed to them apathetic; but I have understood this as a rare manifestation of his spirit which is always so courageous.

"My husband and I have warmly appreciated the many sympathetic messages that have come and are touched by the realization that he has the prayers of many for his recovery. From time to time, we have told him of these messages. There were days in which he really seemed to be gaining perceptibly, but we have gone through a very anxious period during the past week and it has been extremely difficult to give a clear statement of his condition. Whether to operate or not has been a grave problem, but yesterday my husband expressed a distinct unwillingness to undergo an operation and I agree with him and with Dr. Baillie, that great risk would lie in that direction. I do not underrate the possibility of risk if one is not performed. Ere this reaches you we will probably be able to give you a clearer statement."

Operation Performed

The operation was performed after all on the morning of October 15. The result seemed to be satisfactory, but a change came later in the day and Dr. Nitobe passed away toward 8 o'clock in the evening.

While on his sick-bed, Dr. Nitobe continued to write "Editorial Jottings." Nearly a dozen of them arrived after we received the sad news of his departure. I wonder with Mrs. Nitobe whether those writings of a man in the midst of suffering should be published, but I take the liberty of inserting here his last one, because it expresses so clearly his mental state a few days before his death. It is written faintly with pencil, in his own hand.

"Who comes to hear news from a sick-bed, unless it be about his friend? Doleful stories! There are plenty of moans and groans everywhere. Why should we harass you with news of more?"

"Suppose, friend, suppose the news from a sick-room is neither moans nor groans, much less the yells and shrieks of pain.

"Suppose a poor man in his long confinement has found out that sickness is a distiller of the essence of his God-given nature: is that very dismal news?"

"All that man is, is put in a retort. It is heated and cooled and the fluid which is the product is our nature—life itself—whatever be its character.

"In a sick-room we are subjected to this process, and when it is finished and we recover, we rise from our bed men truer, and more beautiful."

He knew his sickness was serious: yet he tried to be genial and even humorous, and hoped until the last moment for his recovery. "I cannot die yet," he was reported to have often said, "I cannot die until I have finished my service to my country."

He was right: his nation was just beginning to feel the need of his great wisdom in national guidance. Then when he realized that it was the will of God that he depart, he could look back on his life with satisfaction and cross the bar smilingly.

Dr. Nitobe is dead, but the lofty ideals he has conceived, and great task he has begun will be carried further and finally fulfilled by the younger men who have come under his personal influence.

Naval Port for Hainan

The construction of a naval port on the coast of the Hainan Island to strengthen the coastal defense of Kwangtung is being contemplated by military authorities.

The vernacular press reveals that the authorities have already drawn up the scheme, which includes the construction of a highway passing round the border of Hainan Island.

The whole project will be undertaken with funds to be raised by a special bond issue. It is also indicated that soldiers may be employed in the construction of the port.

The authorities declare that all communist and bandit forces on Hainan Island have been exterminated, and it is now possible to embark upon the task of developing the natural resources of the Island.

Monsanto Gets Contract

Monsanto Chemical officials of Woburn, Massachusetts confirmed that they received an order for plan specifications and for the catalyst which they manufacture for a large sulphuric acid plant to be built by Mitsui and Co., Ltd., in Japan. The plant, they stated would rank in size among the largest in the world. Monsanto absorbed the Merrimac Company plant in Woburn.

Monsanto does not contract to build plants, but sells licenses, which include plant design and their valuable patented vanadium mass catalyst which has an advantage over the usual platinum mass in cost and efficiency. Monsanto's usual license fee, it is known, is \$700 per ton of daily capacity.

The company's patented sulphuric acid process has obtained world-wide recognition. Plants operating under its licenses are located in several places in the United States and in several European countries as well as in Mexico, Persia, Chile and Borneo and one is under construction in China.

A City of Bridges

Total of 4,394 Structures of Many Types Now Span Streams within Boundaries of Thirty-five Wards that Comprise Tokyo

By W. HARVEY CLARKE, Jr.

A VITAL consideration to-day in the intricately confused traffic problems that exist as a perplexing reality in the Japanese Capital is bridges, for they constitute an adjunct indispensable to the city's national, prefectural and municipal arteries of transportation, which are virtually interlaced by them.

Within the borders of Tokyo's 35 wards, comprising 213.4 sq. miles of incorporated territory that stretches northward and westward from a long bay frontage, there is found an aggregate of 4,394 bridges of



Bridges in Downtown Tokyo

many different types, sizes and descriptions, a large number of which are of comparatively recent date. Covering a total area of 371,721.44 sq. meters, they span not only rivers, but canals, moats and roadways as well. Not a few of these structures, particularly those built within the past decade, are, of symmetrical beauty in addition to their utility, a distinct credit to *The Metropolis of the East*.

Soon after disastrous earthquakes and fires in September, 1923 laid waste practically 50 per cent of Tokyo's former urban area of 15 wards, the municipal administration made



The Reconstructed Umayabashi as it looks to-day with its 152 Meter span, completed September 30, 1929



Odai-Bashi connecting Adachi and Arakawa Wards Spans the Arakawa for 122 Meters. Completed in March, 1933



More Tokyo Bridges all Built within the Past Decade



Financial Center of Japan, Nihombashi Ward, Tokyo, with Two Canal Bridges in Background



The Asakusa District. Azuma-Bashi and the Tobu Interurban Railway Bridge



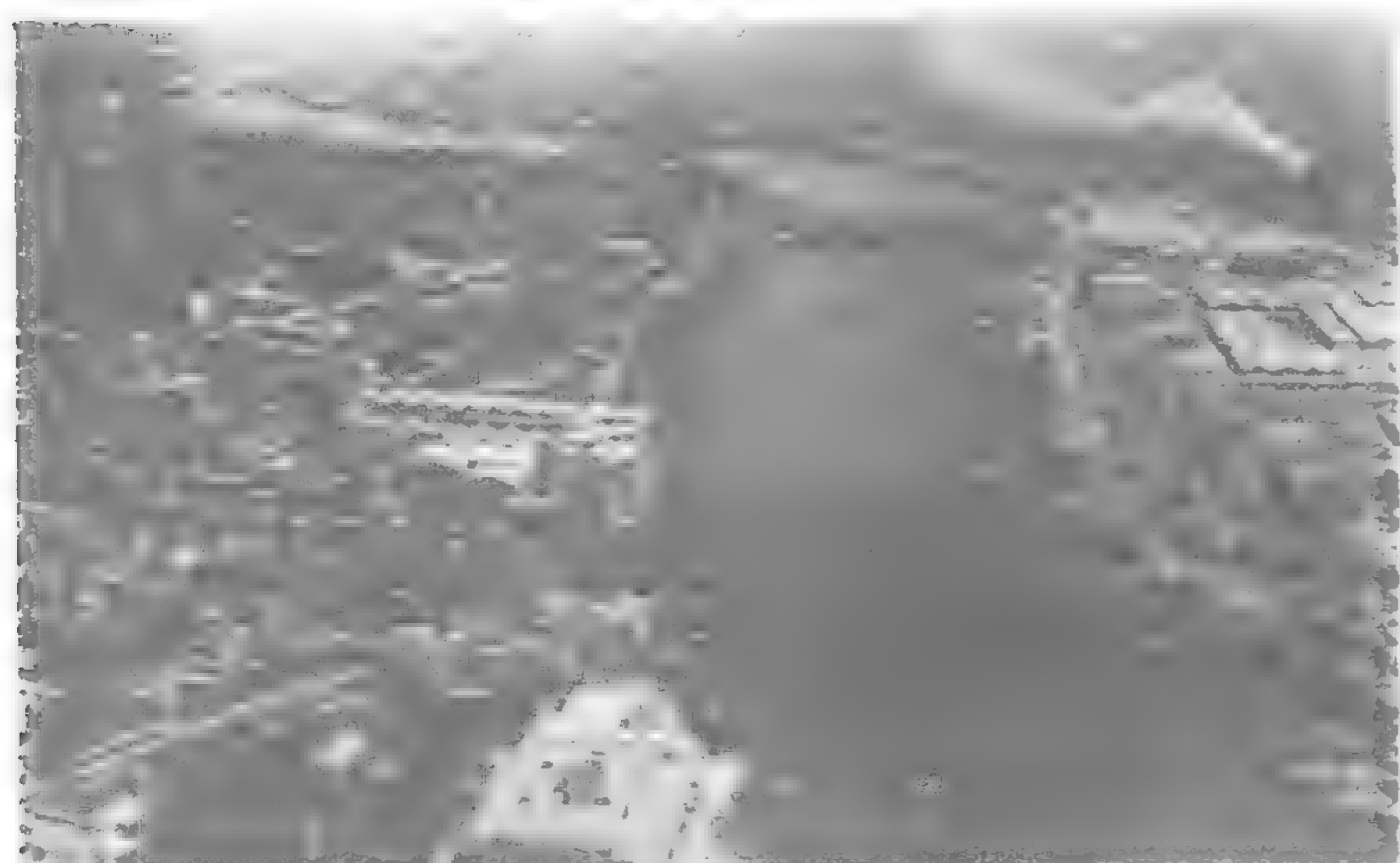
Looking down on the Bridge of Japan with Showa Boulevard on the Left



The New Ryogoku-Bashi and Sumida River Electric Elevated Bridge, both completed last year



Aerial view of the Boat Landing at Shibaura, and the Balanced-Lever Bascule Bridge in Foreground



Bird's Eye view of Mouth of Bridge-Strewn Sumida River where it flows through the Heart of Tokyo



The Owari-sho Intersection with some of the Many Bridges in this Vicinity



Two pictures of the Ryogoku-Bashi, that on the Left as it appeared before the Earthquake that Destroyed in September 1, 1923 and, on the Right the New Bridge which was completed November 18, 1932



The Ryogoku-Bashi under construction showing one of Two Huge Granite Faced, Reinforced Concrete Structures which support in mid-stream the 164½ Meter span



Showing Floor-Girder spans of the new Ryogoku-Bashi crossing the Sumida River under construction



Graceful Arches of the Otonashi-Bashi between the Wards of Takenogawa and Ohji where it spans the Shakujii River. Completed December, 1930



An under side view of Steel Span Sections of the Ryogoku-Bashi as seen recently under construction



The Ryogoku-Bashi as it appeared when nearing completion in the Summer of 1932



The Umayu-Bashi crossing the Sumida as it appeared before the 1923 Earthquake



The Senju-Ohashi spanning the Arakawa in Adachi Ward, completed November 30, 1927



The Shirahige-Bashi, completed in June, 1931, serves as a 167.63 Meter Link between the Wards of Mukojima and Asakusa where the Arakawa separates them



The Honokkudo-Bashi in Katsushika Ward has a 122.4 Meter span over the Nakagawa, completed in July, 1932



Spanning 639.8 Meters over the Arakawa and the Shinhashi Canal between Ohji Ward and Saitama Prefecture, the Twin Shin-Arakawa-Ohashi cost Y.741.856 when completed in September, 1928

New Diesel Electric Ferry, The "Electric Star" Goes into Service at Hongkong

By W. F. SMITH

FOR a long time it has been preached that the Diesel Electric Ferry had a great deal to recommend it, and for almost the same length of time, people have been agreeing with these remarks in theory, but each port authority or ferry-boat owner has always left it to the other man to be the first to start. Salesmen of electrical equipment for this type of ship have found it useless to say, what has been done in New York and in San Francisco: the answer has generally been that something must first be done in Great Britain or the British Empire. It is with great gratification, therefore, that one is now able to refer to the placing of one of the first diesel-electric ferry boats within the British Empire and a type, moreover, remarkable for its unorthodox propulsion.

This ship has horizontal diesel engines driving the generators for supplying current to the motors, and is in every way of such a special and unusual type that it is worth detailed consideration. It is a double ended ferry with a single screw and a rudder at each end. It is owned by the Star Ferry Co. of Hongkong, and it operates between Hongkong and Kowloon on a service which is at present maintained by a number of steamers.

The dimensions of the new Star Ferry are :—

| | |
|------------------------|---------------------|
| Length over-all | 116-ft. |
| Between perpendiculars | 110-ft. |
| Beam moulded | 28-ft. |
| Depth moulded | 10-ft. 9-in. |
| Draft loaded | 8-ft. 6-in. approx. |

The general appearance is very similar to the existing ferries with the exception of the shorter funnel, the "Beclawatt" windows



Scene at the Launching of the Diesel Electric Ferry, "The Electric Star" when the vessel still was on the ways

in the first class deck shelters, and the third class deck which on this ferry gives considerably more available passenger space than the previous ferries having exactly the same overall dimensions. This is due principally to the absence of the large engine and boiler casings.

The under deck arrangement is, however, totally different, the machinery being installed in three separate watertight compartments instead of one as on the existing ferries. The central compartment is termed the generator and pumping room and the immediate adjacent compartments separated from the former by watertight doors are termed the propulsion motor rooms. The remaining compartments are very similar to the existing ferries. It will be noted, therefore, that with the better subdivision arrangement passengers are assured of greater safety in the unlikely event of the ferry being damaged in collision or grounding.

Again the center of gravity of the machinery is much more than the existing ferries and even with the finer lines the stability is greater than its predecessors and of course, the power less for the same speed. The duty is a fairly arduous one and necessitates the carrying of large numbers of passengers, and in what might be described as the rush hours most of the units of the fleet are crowded.

Built at Hongkong

The contract for the ferry was placed with the South China Motor Ship Building and Repairing Works. The main engines and auxiliary machinery has been supplied by Messrs. The Premier Gas Engine Company who sub-contracted with the British Thomson Houston Co. for the electrical equipment. The electrical capstans at each end of the vessel for handling the anchors have been supplied by Messrs. Emerson Walker. The auxiliary generator and compressor set has been supplied by Messrs. Russell Newbury in conjunction with the British Houston Co. and Messrs. Reavell. Messrs. Drysdale have supplied the pumps. The hand steering gear which is of a special type and the watertight doors and gear which is of a special type were constructed at the Shipyard.

In the new ferry boat one *vis-à-vis* engine is fitted and drives a direct current British Thomson



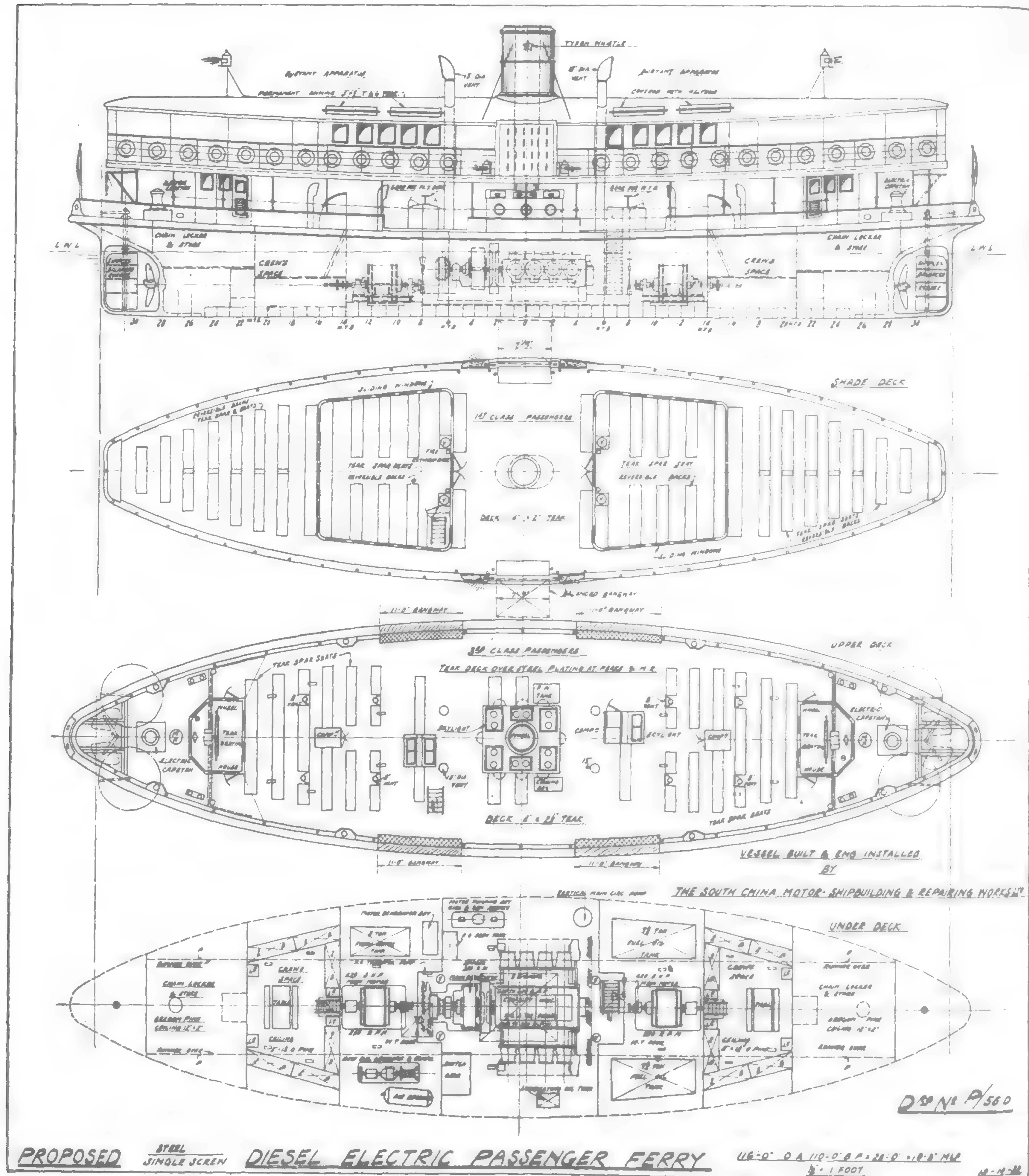
The "Electric Star" pictured as it took to the water at the yards of the South China Motor Shipbuilding and Repairing Works, Ltd., Kowloon

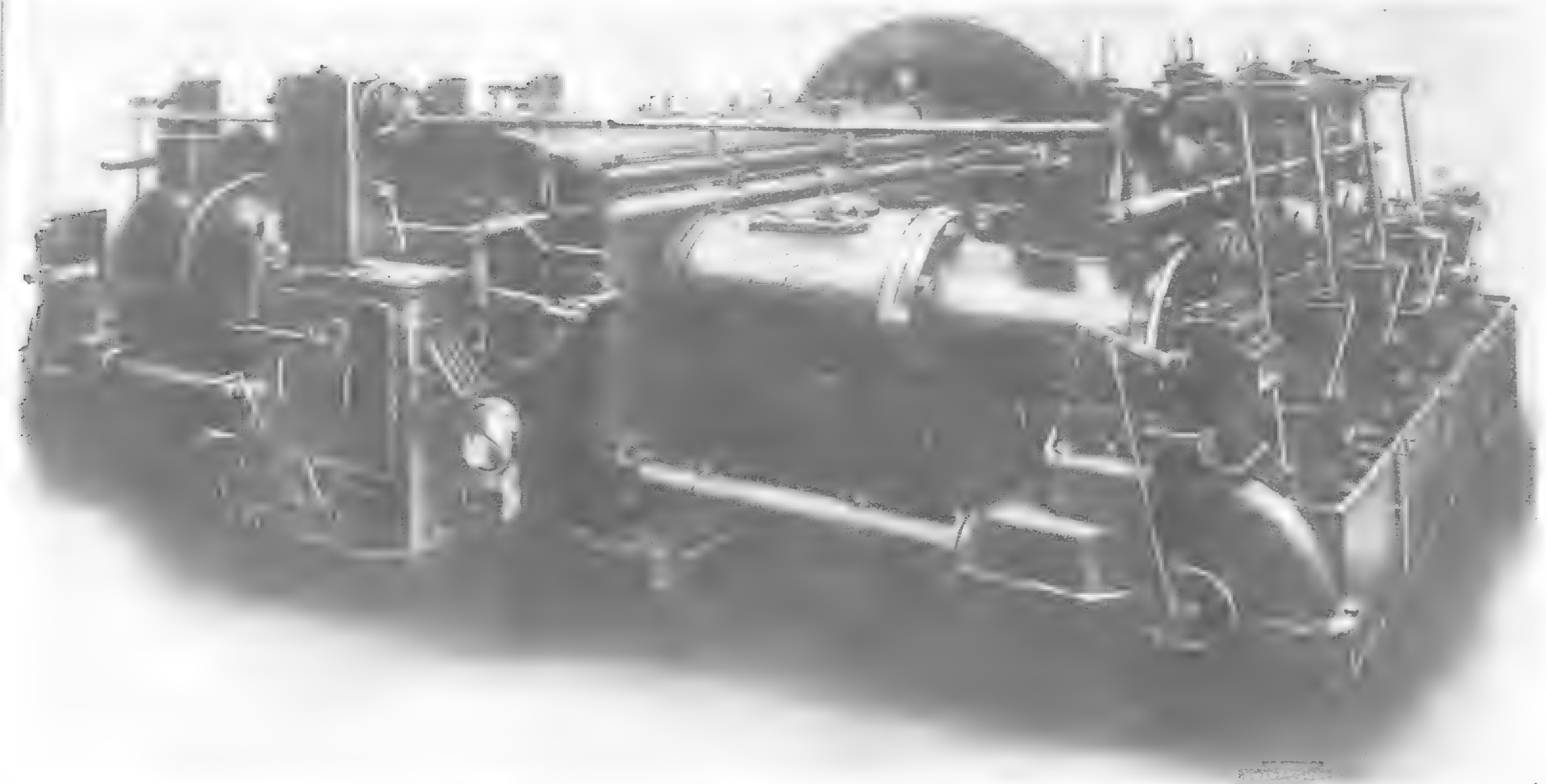
Houston generator with suitable exciter gear. The generator supplies current to one of the two propelling motors at a time according to the direction of the ship.

It is said in Hongkong that the new ferry will be, in all probability only the first of a series that will replace all other steam ferries at present existing in the Hongkong-Kowloon ferry fleets. This appears to be a very ambitious program of reconstruction and one which, no doubt will take place over a period of years if the ship we have under consideration gives the satisfaction that there is every reason to suppose she should give. The Crossley Premier engine is specially adapted for the purpose to which it is put and

permits of direct control from the wheel-house. Differing from the present type it is coupled with electric generators at each end of the boat which forms the actual driving power, only one generator operating at a time and not both as at present.

The boat is provided with simplex balanced rudders. If for the expression "one generator operating at one time" we substitute "one propelling prime mover," then we begin to get something of a picture of what the new ship is like. Pilot-house control, similar to the Ward Leonard system is invaluable to a ship navigating the crowded waters of Hongkong harbor. In fact, so much of an improvement is this ship over existing vessels, that it would not





Showing the Power Plant of the Diesel Electric Ferry, "Electric Star." Horizontal Diesel Engines supplied through Messrs. British Thomson Houston Company by Messrs. The Premier Gas Engine Company

be surprising to learn that other owners of similar ships in the Far East and elsewhere have made up their minds to follow the example of the Star Ferry Co.

The engine in the new ship is a Crossley-Premier 4-cycle *vis-à-vis* KoS unit horizontal type and has eight cylinders opposed operating four cranks, and the rated power of the unit is 540 b.h.p. at 270 revolutions. It is to be noted, however, that this engine is capable of developing 600 horse-power at 300 revolutions and a maximum of 660 b.h.p. for one hour. In spite of the tendency there is to-day to suggest that if diesel-electric propulsion is chosen only the highest speeds of prime mover should be used, the owners have deliberately chosen a slower speed with a more moderate rating. The main B.T.H. generator is a 550-v unit of D.C. type, and this supplies

power for propulsion to one of two 420 shaft horse-power propelling motors. As mentioned above, one of these is operating at the particular end of the ship which happens to be the "stern" end, while the other is merely idling. Control of the propelling motor in operation is from the wheel-house.

The Control Equipment

The control equipment for this vessel is of special B.T.H. design and is the result of experience obtained over a period of 10 years, during which the B.T.H. Co. have been actively working on electric ship-propulsion problems as they arose on the numerous equipments they have supplied. The control system is a distinct advance over the arrangements so far used in that it positively prevents overloads on the electrical system, propeller shafting and engine by a power-limiting device instead of the more usual overload trip gear, the operation of which ordinarily results in total interruption of the power supply should an overload occur. Furthermore, this B.T.H. control system does not depend on a contact-making device or system of relays for its efficient and effective operation either with the vessel under way or when manoeuvring and reversing. Modern practice of bridge control is used, and as the vessel is of the double-ended propeller type, it proves an extremely interesting development in ferry-boat construction.



Another view of the "Electric Star" on the Ways

First Soviet Blooming Mill

The installation of the first blooming mill built in the Soviet Union was recently completed at the Makeyevka steel mill in the Donetz Basin. This mill, which cost two million roubles to build and occupies an entire building, marks a major achievement in the Soviet heavy machinery industry. It will roll steel blooms for rails and girders. The equipment for the mill was built at the Izhor machine-building plant near Leningrad. Operations were expected to start in the first week of January.

The Taming of the Yangtze

Blasting of Massive K'ungling Rocks in Gorges Opens New Channel and Marks Great Improvement for Navigation

By H. RIDLEY DIXON, M.C., B.Sc. in Commercial Asia

THOSE who know the Ichang-Chungking section of the Yangtze will understand that it would take volumes to give an adequate account of it in a few minutes, but some of its problems may be described briefly.

The Upper River is the main artery for commerce for the whole of Western China, and of a population greater than that of the United States. All-the-year-round navigation by steamers only started in 1922. In the nine years following there were 239 accidents to steamers, including 50 very serious ones and 12 total losses. There would have been far more of the last but for the fact that there is nearly always a possible beaching ground near the more dangerous rapids, and ship-masters are uncommonly clever in just getting there before the ship sinks. No ship ever dreams of sailing without a supply of cement on board, and temporary repairs are made, and, if necessary, the ship then comes down to Shanghai for docking. Over 1,000 steamer trips are made altogether every year, which speaks volumes for the captains and pilots.

Of the many rapids, there are some which only form at mid-level or at high level, when the increased volume of

water is too great for the width of the channel, but most of them appear only at low level in winter. They vary widely in difficulty for steamers, but in one case, the Hsintan, there is an actual drop of six feet in 50 yards. Up such rapids steamers can only force their way with the aid of steel ropes anchored to the banks.

On a hill overlooking the Hsintan stands the monument to Captain Plant, the pioneer of all commercial steam navigation on the river, and who was later the first Upper River Inspector of the Customs Service.

Every level and state of the river has its own special dangers from rocks. Most of them are easily avoided when exposed or nearly uncovered, but become very dangerous when the broken water ceases to mark their exact position. The water conditions are always changing. In winter the channels in the gorges are mostly smooth and placid, but at high level, or during a sudden rise they become a boiling mass of whirlpools and cross-currents, as the swollen river forces its way downwards to the plains. The low level rapids are then covered by 100 feet, or more, of water, while the depth in some of the



The Firing Shelter 400 yards from the rocks behind which the engineers stood at the time of the blast



Scene when the Great Blast took place when seven tons of explosive dislodged Ten Thousand Tons of Rock hurling fragments 1,200 yards



Here is the scene when the engineers placed the heavy charges of explosive, showing the precipitous cliffs that overhang the K'unlingt'an

gorges is then nearly 500 feet. Pilots never use charts. They are expected to know every yard of the river at all seasons, but actually they learn to read the surface of the water in a very wonderful way, and their quartermasters know to a fraction the meaning of each movement of the pilot's finger which controls the ship.

These are the conditions which are faced year in and year out by the men of the river, and within the last two years a beginning has been made in the direction of channel improvement on the initiative of Chinese and foreign interests in Chungking. They decided to try and deal with the worst place first. 75 per cent of all accidents occur during low level, and a large proportion of these at K'unling-t'an, in the heart of the Gorges, sometimes called the "Devil's Gate."

The Chinese Maritime Customs were asked to collect funds and to carry out the work, and in the winter before last Mr. R. G. Everest, then Upper River inspector, began operations. It was a year of unusually high low level and little could be done, but a great deal was learned about the problem. The difficulties of removal of the submerged rocks in the existing North Channel were found insuperable, but a study of the quite unknown South Channel to the south of the island of Tachu, suggested that the two great rocks which commanded its western entrance were the main cause for the appalling confusion of boils, races, eddies, and whirlpools which formed it.

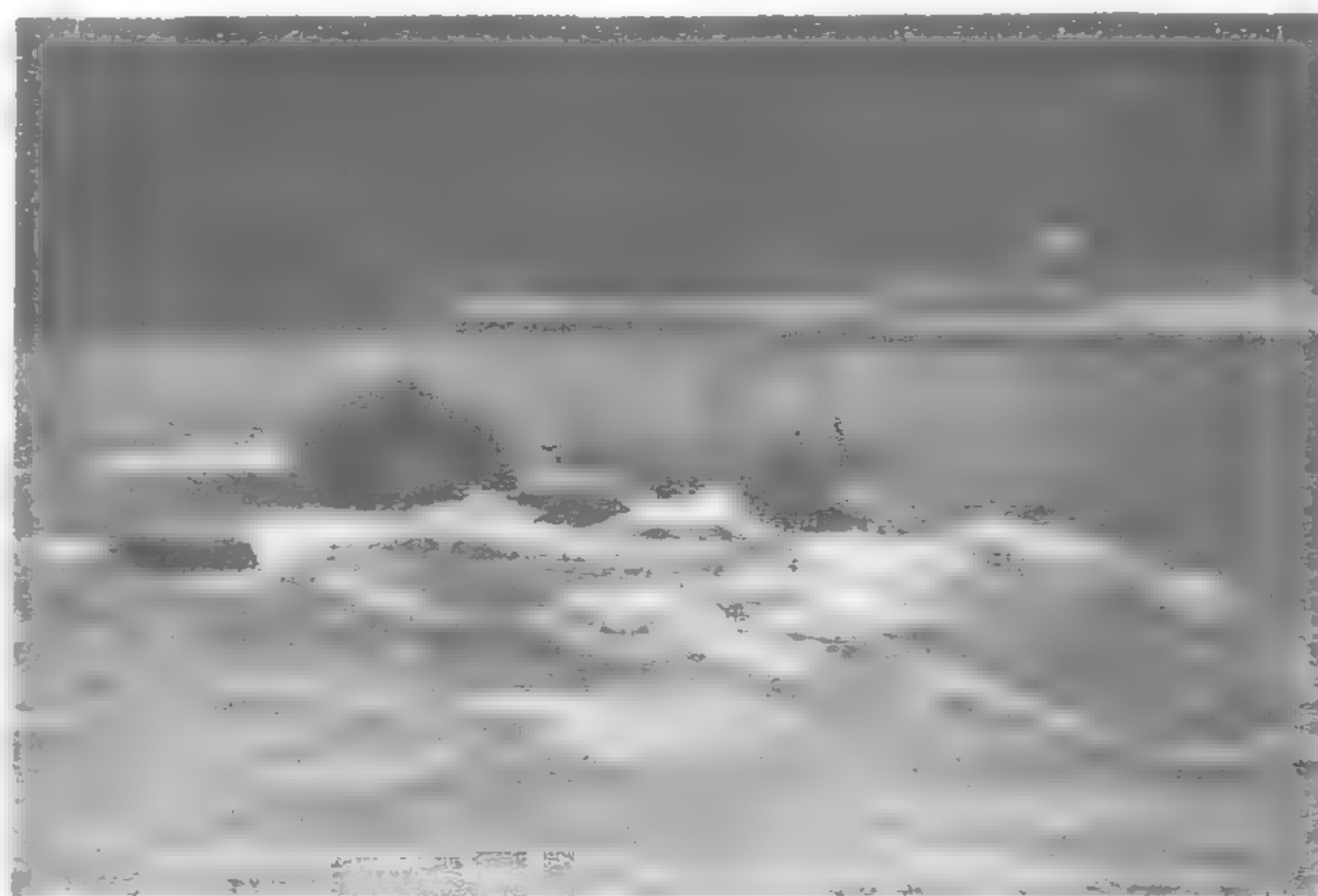
Last autumn I made certain suggestions to the Customs authorities as to methods of rock removal, and the whole problem was again investigated

in December last, and the scheme approved. The photographs will convey some idea of the conditions under which this work was done. The method used was that of mass blasting, which is really very simple. All that has to be done is to get right inside the rock and to lay large concentrated charges at a suitable depth. They are then sealed in with reinforced concrete and the rock disappears when required. The charges must be big enough to ensure complete shattering and wide distribution of the rocks, so that no large pieces are dropped into shallow channels which might block them up. Actually, in these operations the mining work alone took eight weeks of intense effort, and was only completed just before the river rose. More than seven tons of high explosive was used for the final charges, and ten thousand tons of rock were scattered in all directions up to a distance of 1,200 yards. The mines were fired from close beside a

steel-plate shelter behind a large rock 400 yards away. Mr. Yagyu, whose photographs are reproduced here took the picture of the blast from the top of the rock before following us all into the shelter, which proved both adequate and welcome.

The problem of transport to the rocks was solved by Mr. Frandsen, who has lately been appointed to succeed Mr. Everest as Upper River inspector, by a very clever system of bridges. The mine shafts were protected against sudden rises in river level by the reinforced concrete ships which were built on the rocks.

This was only one of the problems that required very careful geological study. The composition of the rocks



Approaching No. 3 rock to make the first landing. The snap merely suggests the water conditions around the rock

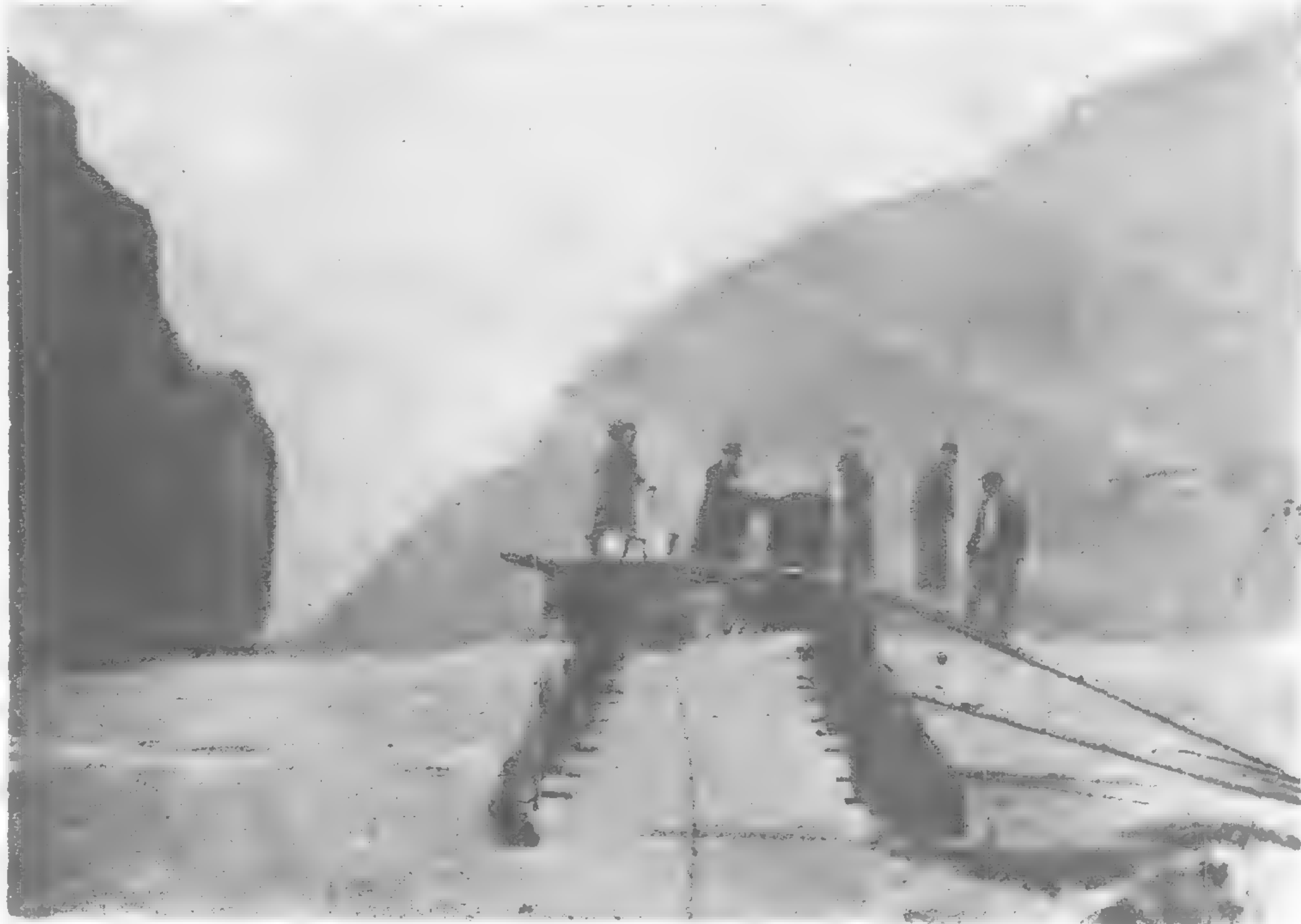
themselves had also to be ascertained by comparative study of others, as they were still covered when the investigation was carried out in December, in order to assure that the great overhanging cliff at the entrance of Ox Liver and Horse Lungs Gorge would not be brought down.

This was the first large scale improvement scheme ever carried out on the Upper River. It has provided an alternative low water channel 200 feet wide and nowhere less than 18 feet deep, and, next winter, when pilots have had a chance to learn it, it is expected that ships will use it, and be able to avoid the dangerous and tortuous North

Channel where so many wrecks have occurred. Under Mr. Everest's command, the *Hsia Kuang* made the first three passages up and down the new channel on March 28.

The basis of any improvement work must always be a thorough survey of the bed of the river. This sounds simple, but on the Upper River is far from it. The work of the river staff, sounding from sampans swaying and bouncing in the whirlpools is thrilling to watch. In many parts of the South Channel it was impossible to get accurate soundings near rocks on account of the strength of the current. The power of the water in such places is almost incredible. Neither lead nor bamboo can be induced by any means to go downwards.

Although there are hundreds of rocks which could be removed with great advantage to shipping, the main object at present is so to straighten the worst bends of the channel throughout its length of 350 miles that longer ships



No. 3 rock and the cofferdam in the making. Taken from suspension bridge between Nos. 2 and 3 rocks

scheme for damming the whole river above Ichang, so doing away with all rapids for all time, and providing enormous electric power for Central China. I see that the scheme has been shelved by the

Ministry of Industry for financial reasons, and it is unlikely that anything more will be heard of it for many years to come. But it is hoped that the work of channel improvement now started will be continued. I am told by those who know the river well that most of the other places that need attention should be easier to deal with than K'unglingt'an, but it is difficult to express any opinion, as an engineer, without careful investigation.

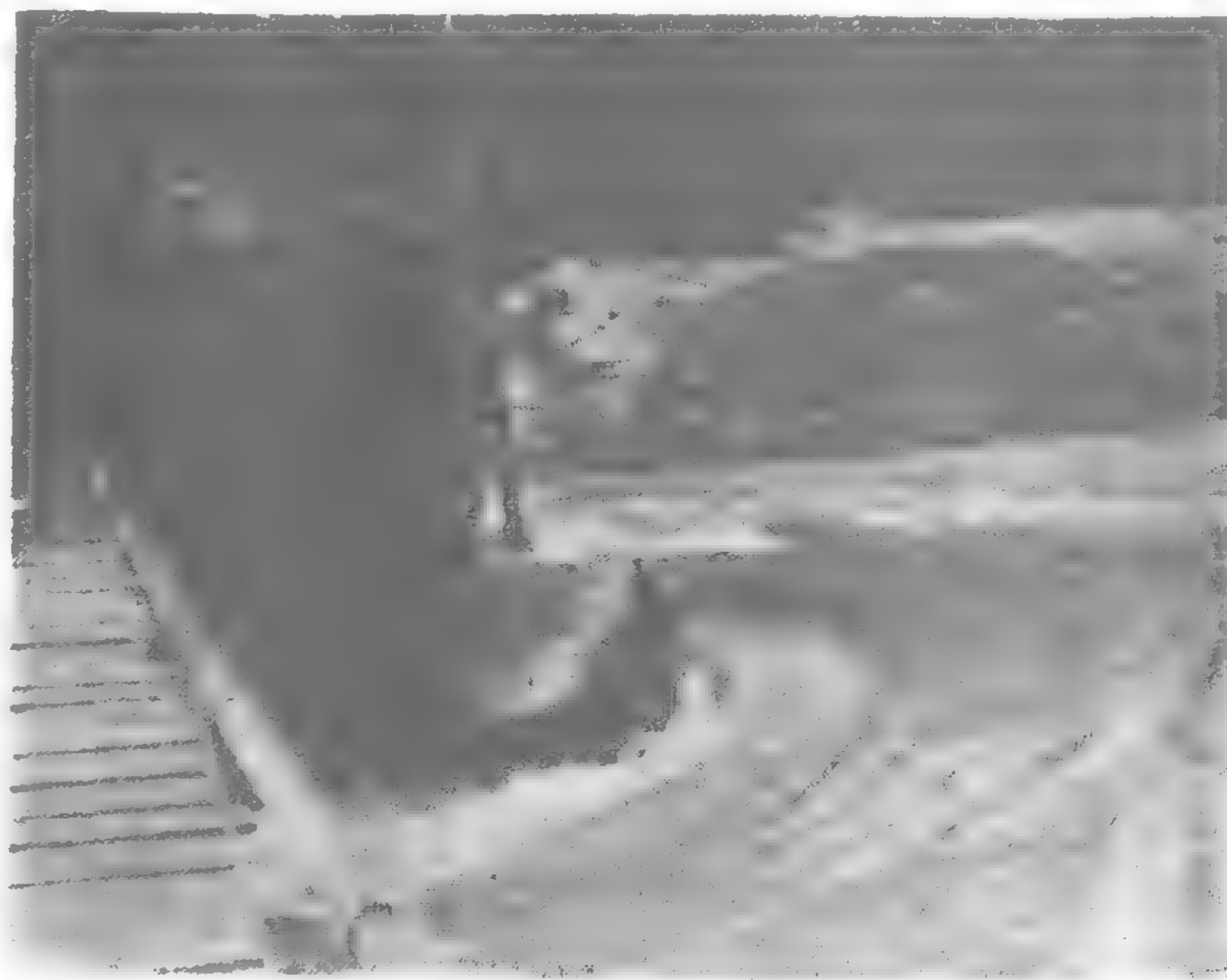
Anything that contributes to the end in view must confer a boon upon China and the world as a whole, for few things are of greater importance in this country than communications. Some of us look forward to the day when far larger ships will travel the waters of the Upper Yangtze with



The first bridge Tachu to No. 3 and the cofferdam being constructed



Rock with cofferdam just completed. Wires for suspension bridge between Nos. 2 and 3 rocks are seen in foreground



The bow wave at No. 2 rock

will be able to navigate it in relative safety. The present safe limit for ships at dead low water is a length of 140 feet, and as they have to find space for engines of some 2,000 h.p. there is little room left for cargo, while insurance rates are very high. They are all fitted with at least two, and usually three, rudders for quick turning, but downstream they are often making 20 knots in the rapids, while upstream, making slow progress against a current of eight knots or so they are liable to be set over onto rocks by the boils and running whirlpools before the rudders can take effect.

There has been talk of late about a great



Showing complete bridge system in operation with drilling and blasting proceeding at No. 2 cofferdam. A mooring platform was built to which No. 3 bridge could be raised in event of sudden rise of water

increasing safety. One reason for my own optimism in this respect is the wonderful spirit of "Can Do" which exists among the men of the river, and the enthusiasm of the river staff for their dangerous and patient work.

Chungking itself exemplifies the go-ahead spirit of to-day. Ten years ago a wheeled vehicle of any kind was almost unknown there. To-day there are many wide streets and fine buildings. There will soon be a real ricscha problem, and it is possible, between wars, to travel hundreds of miles by motor-car. The new road to Chengtu, is suggestive, in its many cleverly engineered viaducts and bridges, of the roads of Switzerland and America.

If so much has been accomplished in so short a time there is good reason to hope that this progressive spirit will spread, and

spread quickly. But river improvement must take time. There are only a few weeks each year when work can be carried on, and very careful study is necessary if the condition is not to be made worse than before.

It is impossible to live for months in the middle of a rapid on the Upper Yangtze without gaining a boundless respect for the great river, which deepens into awe. The continuous roar of the waters, the infinite variations of its eddies and swirls, the staggering immensity of its cliffs and mountains, all produce an indelible impression on the mind. There are few corners of the world where the working of natural forces is better illustrated, not only in the marvellous geological record outspread for all to read, but in the day to day presentment of those same great powers still endlessly at work.



Showing the bridges alongside Tachu



Another view of the bridges and cofferdams on the rocks

The amazing variety of rock formations, the sculpture of millions of years, brings one into close touch with the reality of things, so that the apparently epoch-making events of our day are seen in truer proportion as tiny incidents in the unfolding drama of world history.

* * *

Supplementing the foregoing the following descriptive matter devoted to the vast project of improving the Yangtze at K'ungling by the removal of two massive rocks which obstructed the South Channel is taken from the October number of *Eastern Engineering and Commerce*.

The operation, carried out under hazardous and extremely uncomfortable conditions, reflects great credit on the Marine Department of the Chinese Maritime Customs and the men immediately concerned, viz., Mr. H. Ridley Dixon, M.C., B.Sc. (in charge of operations), Mr. R. G. Everest (Upper River Inspector), Mr. S. C. Frandsen (District River Inspector), Mr. L. St. J. Manby (Assistant to Mr. Everest), Mr. C. V. Brammall (borrowed with his ship, *Hsia Kuang*, from the Middle River Inspectorate), and Mr. H. Yagyu (diver). As pilots can only learn the navigation of the Upper Yangtze by actual experience it may be some years before the full benefits of the work done become apparent. Already, however, navigators greatly appreciate the entire disappearance of the dreaded boils and whirls which made entrance to the channel a veritable nightmare, and it is hoped that the new channel will enable larger ships to continue to operate at least as far as Wanh sien throughout the low-water season.

The operation was carried through by mass blasting. Nine shafts were sunk in the two rocks to be removed, and charges totalling 16,200 lbs. of Nobel's blasting gelatine, gelignite and dynamite were detonated simultaneously. Messrs. Jardine, Matheson and Co., Ltd., supplied all of the explosives, of which the following quantities were used:—

4,000 lbs. Polar blasting gelatine 1.7/16.

7,250 lbs. No. 1 gelignite

4,950 lbs. No. 1 dynamite

1,000 pieces electric detonators, low tension No. 7 (submarine).

Accessories such as submarine connecting wire, shot firing cable, joint adaptors, exploder and kindred equipment, all of which were of Messrs. Nobels' manufacture, were also supplied.

As regards equipment, the Jardine Engineering Corporation, Ltd., supplied the following:—

One type 20 9-in. by 8-in. portable gasoline engine driven compressor.

Three type S.49 blower tube style, jackhammers and necessary hose and steels.

One No. 6-F oil furnace.

One No. 34 sharpener.

One No. 34 S.P. shank and bit bench and accessories.

One No. 8 grinder.

A generous quantity of spare parts for all the equipment were also supplied. According to Mr. Dixon, the equipment gave absolutely not rouble whatsoever, even though it was subjected to the most gruelling conditions, and on no occasion throughout the whole period did the compressor fail to start up at the first time of trying.

To understand the conditions it is necessary to quote from a most interesting account of the operations which appeared in the Magazine Supplement of the *North-China Daily News*. It was written by Mr. H. R. Dixon, and is entitled "A Winter in the Yangtze Gorges," the enterprise having entailed a five months' winter absence from Shanghai and its comforts.

Mr. Dixon describes the scene of operations as at the point where the Tachu (Great Pearl) rock divides the river into two, this obstruction and the series of rocks north-east of it, known collectively as the Pearls, having accounted every low-water season in the past for many disasters. Thirty-three miles up river from Ichang, Tachu itself is some 700-ft. long by 150-ft. wide, and 50-ft. high at local zero level. In summer it is covered by 90-ft. of water, so enormous is the rise in the great river, which piles up in the narrow Gorges before flooding out across the plains. Two years ago shipping and commercial interests in Chungking and Wanh sien formed the K'unglingt'an Improvement Commission, and the Commission placed the collecting of funds and direction of the technical work in the hands of the Chinese Maritime Customs.

Accordingly, the staff already named were sent to the Tachu. There was only one decent patch of sand, and on this unusual site "Hope Cottage" was erected.

"Prior to this," writes Mr. Dixon, "we had lived on the *Hsia Kuang*, while Everest and the others made a very thorough survey of the channel to the south of Tachu. No description of mine can do justice to the conditions under which they worked. Their sounding sampan swirled and swung and bounced in the boils and whirlpools, while the engineer took photographs of them and of the geologist's paradise around, and dreamed of mine shafts to be made in rocks which were still covered by the slowly falling water. During the previous season Everest and Frandsen had been able to make a preliminary study of the whole problem, though an unusually high winter level had prevented a great deal being done in the way of actual rock removal. But having found that it was impossible in the vicious swirling current to attack the submerged rocks in the North Channel, they turned their attention to the even more turbulent South Channel, in which the presence of two great rocks at the western end caused extraordinary conditions of currents, boils and stationary and running whirlpools. This had always hitherto, with good reason, been ruled out as hopelessly impracticable for any class of power craft. But it was really the main channel of the river, and if only those two rocks could be moved there was every prospect of a deep channel up which the largest ships in use on the Upper River could proceed in safety all the year round."

It was Frandsen who first thought of bridges. The day after landing on the first rock (January 27), he flung a semi-suspension bridge, partly supported by sampans, across the gap from Tachu. For the next eight weeks work never ceased from daybreak to dusk.

"As soon as the first bridge was over we started the construction of a reinforced concrete 'ship' on the rock, although it was still being swept by water. A similar one was built later on the other rock, and it may be claimed that these were the first ships on the Upper River which ever started their life by sitting firmly on a rock and doing a steady seven knots through the water. The 'ships' were only 16 feet long by 12-ft. wide, but they gave protection when the river rose, and prevented our mine shafts being flooded out, and our cranes and pumps being swept away. They were not built easily, and Mr. Yagyu and his diver stood up to their waists in the full current, and by making a series of dams and lagoons, secured still water around the base of the first one, and sealed it off with cement.

"As it was, the shafts leaked pretty badly, because the schist of which the rocks consisted, while even harder than granite, was inclined to fissure a long way out as we blasted our way into the heart of the rock, and we had to work the pumps more and more continuously as we got deeper down. In one shaft we had to stop to put in a concrete lining from top to bottom to lessen the flow, and this was done by Mr. Yagyu and his diver under water, for when the shafts filled up, which they did very quickly if the pumps were stopped, the water inside was nice and still for once, and the cement was able to set in comfort.

"It was necessary to exercise great care in blasting our way down. On the western rock we only had three feet of rock between us and the river on two sides, where it fell sheer to a depth of 40-ft. In this shaft we had to use mass concrete supports to strengthen the fragile rock walls above us, and these, too, were laid by the diver under water. It was not until March 14 that the mining work was finished, and we were able to commence to lay the charges. . . . The water fell steadily, reaching its lowest level for the year, only 0.8-ft. above local zero, on Zero Day, March 22. We should have preferred a level much nearer to the top of the 'ships' for we had counted on the effect of the surrounding water to help the explosive effect on the rocks, and to this may be due the fact that an utterly complete success was denied us." (One pinnacle of rock remains which will have one foot of water over it when the river is at zero).

To continue the story of the blasting. "The first thing to be done was to put all the gelignite and dynamite into petrol tins and 130,000 sticks were packed one by one. The tins were closed with wooden plugs and sealed with pitch, and carried across the island in rope nets made for the purpose, and so along the bridges to the rocks, where they were lowered by the cranes and stowed in the chambers at the bottom of the shafts. Reinforced concrete was then put in above the charges, and after it had set well the shafts were filled up with rock and sand, special additional charges

being built into the demolition chambers left in the concrete 'ships' themselves. Last of all detonating charges were lowered down the steel tubes left in the shafts for this purpose, and the necessary electric wires were run out between the rocks and across to the South Bank along steel wire ropes. Thence they were led to the firing point 400 yards away, where behind a big isolated rock in a patch of sand a strong shelter had been made of steel plates and sandbags. Government troops spent long days in explaining to the local inhabitants what was going to happen on the twenty-second. The whole population was evacuated that day to a distance of nearly two miles. Zero Day began by prolonged blasts on the whistle from the *Hsia Kuang*. Frandsen then took the ship, with the lighter and motor sampan, up to Hsintan, while we set off in sampans to the South Bank, firing battery in one sampan and exploder in the other, for all the firing arrangements were duplicated, and every possible precaution taken to avoid failure. Then came the final connections to the switches. Junks and sampans had vanished from the river, and the whole wild valley was utterly deserted save by ourselves.

"Everest moved the switch, and we saw a prodigious instantaneous cloud of black smoke, which filled the entire valley. Mr. Yagyu, who is as nearly devoid of fear as any man I have ever known, secured a beautiful photograph of the blast from the top of the rock, before following us all inside the shelter. Everest photographed the splashes as the stones rained down into the river beside us, and later we found pieces up to 200 pounds weight had been flung as far as 1,200 yards.

"As we walked up the river bank, we could see that though all traces of the two big rocks had gone above water, there was a patch of disturbed water at the western entrance, which indicated that something still remained not far below the surface, and the disappointment was bitter. We found, on returning to Tachu, that the whole of the western end of the island had been swept by a colossal wave, and the men's hut was completely flattened, while 'Hope Cottage' was partly wrecked. Some 34 houses were damaged in the village, but all claims were dealt with promptly, and all the owners were satisfied.

"For the next few days Everest and the others were busy sounding and sweeping the new channel, and found that there was, as we had so much hoped, a new deep water channel 200-ft. wide to the south of Tachu."

A City of Bridges

(Continued from page 500)

The simultaneous construction of so great a number of both large and small bridges of steel or ferro-concrete realized in the nation's capital during the short space of ten years is an outstanding achievement unrecorded in all Japanese history.

Street improvement was one of the chief concerns of the rebuilders of the city of Tokyo. To-day they have advanced far along the road in facilitating communication between its widely separated districts. An unprecedented increase in automotive traffic made it imperative for many streets to be relaid, widened and paved. Bridges, in consequence, had to be designed to conform to the plans for reconstruction. At the close of 1930, 294 bridges out of a total of 310 to be built in Tokyo's former area of 15 wards were already completed.

NINE OF TOKYO'S NEWEST BRIDGES

| Bridge | River | Length | Effective Width | Cost | Date of Completion |
|---------------------|---|--------|-----------------|-----------|--------------------|
| | | Meters | Meters | Yen | |
| Senju-Ohashi | Arakawa, Adachi Ward | 92.5 | 24.2 | 686,000 | Nov. 30, 1927 |
| Shin-Arakawa-Ohashi | Arakawa (between Ohji Ward and Saitama Pref.) | 639.8 | 7.8 | 741,856 | Sept., 1928 |
| Umayabashi | Sumida R. | 152 | 22 | 1,134,397 | Sept. 30, 1929 |
| Otonashibashi | Shakujii R. (between Takinogawa and Ohji Wards) | 48.76 | 18.18 | 144,065 | Dec., 1930 |
| Azumabashi | Sumida R. | 150 | 20 | 1,230,922 | June 14, 1931 |
| Shirahigebashi | Arakawa (between Mukojima and Asakusa Wards) | 167.63 | 22.14 | 886,000 | June, 1931 |
| Honohkudobashi | Nakagawa, Katsushika Ward | 122.4 | 13.24 | 98,464 | July, 1932 |
| Ryogokubashi | Sumida R. | 164.5 | 24 | 1,007,939 | Nov. 18, 1932 |
| Odai-bashi | Arakawa (between Adachi and Arakawa Wards) | 122 | 7.5 | 104,204 | Mar., 1933 |

Fushun Coal Mines

Eight Sets of Turbo Blowers for Producer Gas

HEREWITH is shown a picture of a Sulzer high-pressure centrifugal blower, delivering 53,000 cub. ft. per min. and driven by a 400 h.p. Sulzer steam turbine. Eight sets have been supplied to a mining company in the Fushun district of Manchuria for handling producer gas. Each blower is driven at 1,400 revs. per min. by a Sulzer 400 h.p. steam turbine.

Blower and turbine have separate shafts, the two being connected by means of a flexible coupling. Although it would be possible to have a considerably strengthened turbine bearing on the blower side in order to allow of the wheel of the blower being mounted upon the turbine shaft, an arrangement which would have considerably shortened the length of the whole set, the construction chosen offers various decided advantages with regard to the service for which the blowers are intended.

Transmission of heat from the turbine to the shaft of the blower and its stuffing box is practically eliminated. The stuffing box packing is comparatively long; in each packing in the middle there is a lantern into which grease can be forced by a hand press. This arrangement is of great advantage if the packing has been tightened up or replaced, since it facilitates the running in.

The bearings of the blower are of ample dimensions; they are fitted with ring lubrication. The oil wells, from which the rings withdraw the lubricating oil, are provided with water cooling.

The axial stress is to a large extent compensated by the wheel of the blower and the rest is taken by a ball bearing.

The calculated characteristics were checked on the test bed. For this purpose, a measuring branch fitted with a nozzle was fitted on the suction side and throttle discs were used on the discharge side at the diffuser outlet. The power required was measured electrically on the motor employed for driving the blower, a 500 h.p. asynchronous three-phase machine running at 1,450 revs. per min. The quantity of air handled, and the vacuum or pressure generated, were determined with the blower working to generate vacuum and also pressure. The results of the tests corresponded exactly with the calculations. The trials also showed that the careful static and dynamic balancing of the blowers is thoroughly satisfactory.

The pipe connections to the oil coolers are located in the bedplate of the turbine. Above the turbine is the oil-operated speed governor, an apparatus which works practically without wear and always with the same precision. A tachometer is mounted on the common

bedplate to show the speed of the set, and is driven by a belt from the blower shaft.

In the present case it is particularly advantageous to drive the blowers by steam turbines, since the exhaust steam can be utilized in the works and, because of the ease with which the speed of the turbine can be regulated, the output of the blower can be adjusted exactly to suit the requirements of the works.



Sulzer High-pressure Centrifugal Blower. Eight Sets supplied to a Mining Company in Manchuria

The Hai Ho Palliative Scheme in Operation

(The following article from the July number of "The Journal of the Association of Chinese and American Engineers" is supplementary to an article by the same author, which was published in "The Far Eastern Review" for May, 1933, and which was also taken from "The Journal of the Association of Chinese and American Engineers".)

C. Y. KAO, Chief Engineer, Hai Ho Improvement Commission

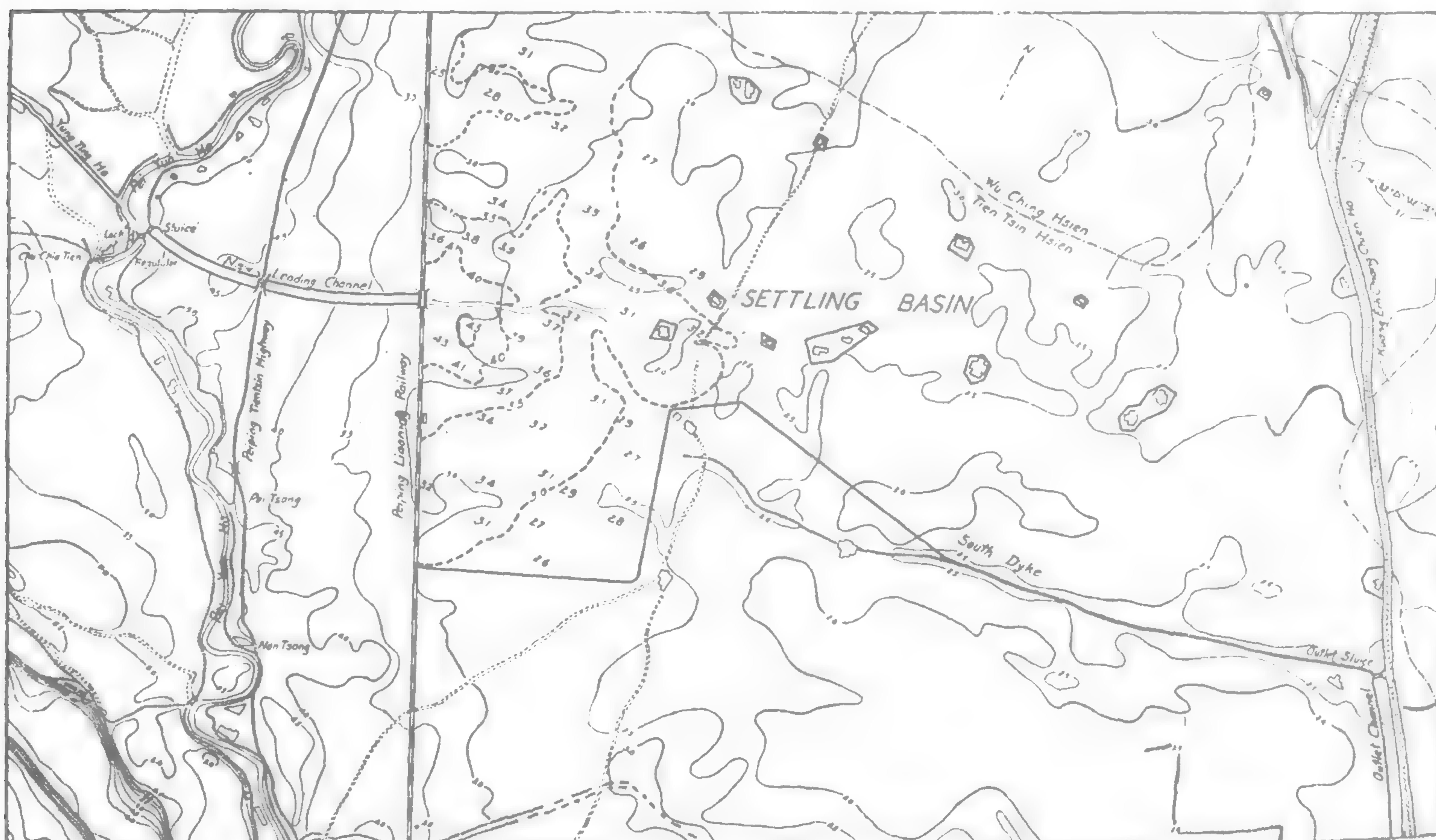
ALL the composite works of the Hai Ho Palliative Scheme (described in the March, 1933, issue of this Journal) were completed by May, 1932. The Hai Ho Improvement Commission adopted a set of regulations governing the operation of those works during the summer freshet of 1932, as follows:

- (1) During the summer freshet, 1932, the following works and their staff shall be placed under the authority of an Executive Committee organized by the Hai Ho Improvement Commission, Reconstruction Bureau of Hopei and North China River Commission in charge of their supervision:— Chu Chia Tien Sluice, Regulator, and Navigation Lock; New Leading Channel; Settling Basin; Outlet Sluice; Outlet Channel; Tu Men Lou, Suchuang and Hsin Kai Ho Sluices; and Yung Ting Ho Delta Culverts.
- (2) The Executive Committee will be placed under the control of the Chairman of the Hopei Provincial Government.

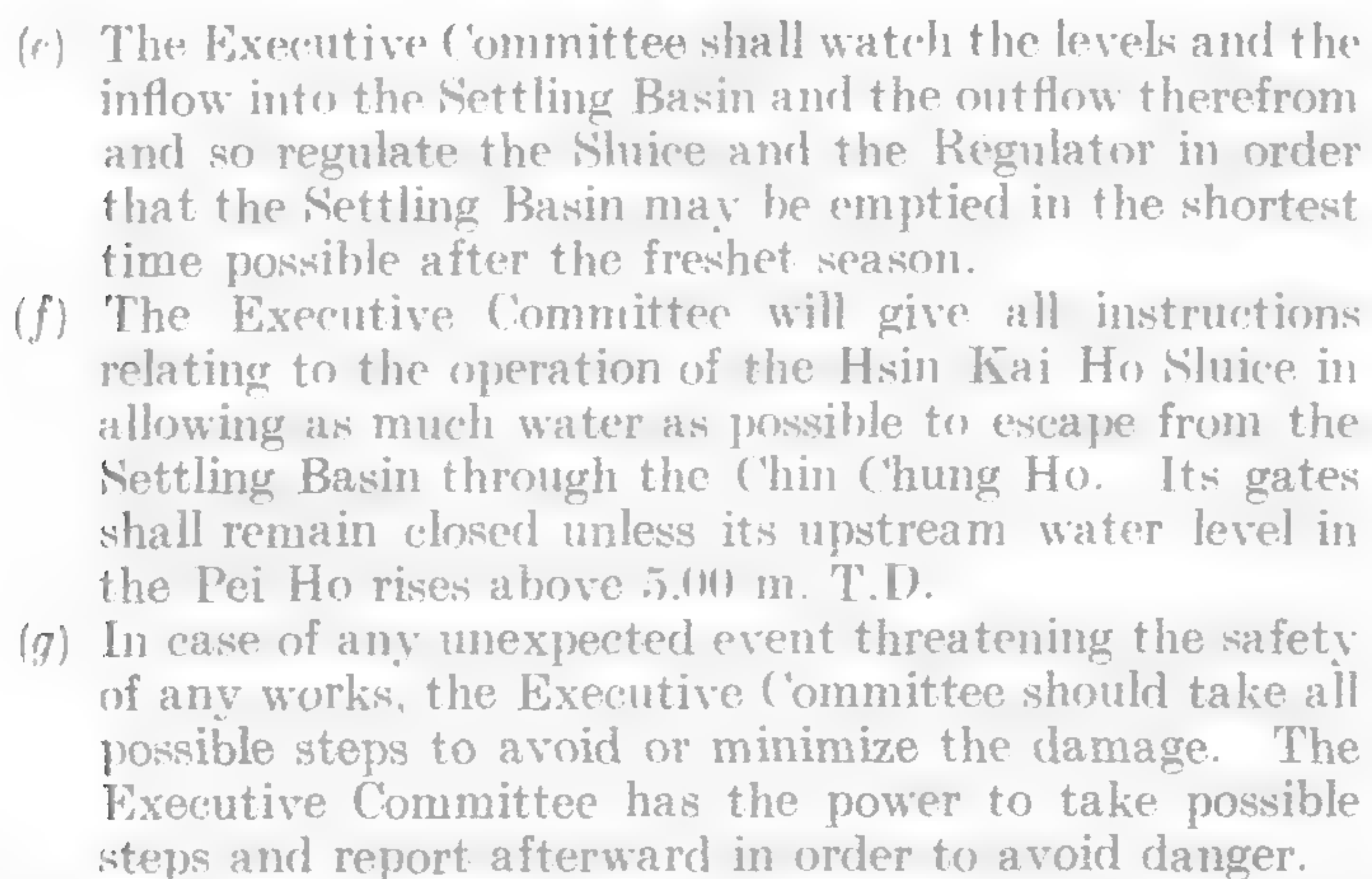
The Executive Committee will have their office at the Hai Ho Improvement Commission office, where they will daily receive, by telephone, from employees permanently stationed at Lu Kou Chiao, reports about the behavior of the Yung Ting Ho freshet. They will also receive daily reports from the operators of the different works enumerated above.

- (3) The Executive Committee will give the necessary instructions for the operation of the works according to the following general principles:

- (a) As soon as the Pei Yun Ho and Yung Ting Ho freshet commences to bring down silt (particularly when the Yung Ting Ho water level at Lu Kou Chiao reaches 61.00 m. T.D., or when the total amount of silt brought down by the two rivers is more than 10,000 cubic meters per day) the Chu Chia Tien Sluice gates shall be opened and the Regulator gates closed.
- (b) In order to prevent the water level from rising dangerously above the Regulator as a consequence of a strong freshet, the gates of the Regulator shall be partly or completely opened when the water level above the Regulator reaches so high that either dyke above Yang Tsun and east dyke below Yang Tsun upstream of the Pei Yun Ho may be endangered (this water level is estimated at the Regulator about 7.50 m. T.D.). The Regulator gates will be again closed when the water level above the Regulator falls down.
- (c) If the water level below the Regulator falls below 3.20 m. T.D., one or two gates should be opened, in order to raise the level to maintain possibility of navigation on the Pei Yun Ho, but it is desirable that the amount of water let down should be limited to about 10 cubic meters per second.
- (d) The Chu Chia Tien Sluice should be closed and the Regulator opened when the water level in the Settling Basin reaches 4.20 m. T.D. But when this level falls below 4.20 m. T.D., the Sluice gates should be again opened.



Topographic Map of Settling Basin showing Silt Deposit Summer, 1932. Full line contours indicate Ground Elevations before Summer of 1932. Heavy dotted line contours indicate Ground Elevations after Summer of 1932.



Diversion of Spring Freshet, 1933

In order to further improve the Hai Ho, it has been found necessary, after investigation, to divert the spring freshet of the Yung Ting Ho as well as the summer. It was decided by the Hai Ho Improvement Commission that the Yung Ting Ho spring freshet of 1933 should be diverted into the settling basin, and the operation of works should be governed by the same regulations as for the summer freshet of 1932.

The Yung Ting Ho began to rise in the morning of March 17, and its silt content was found to amount to more than 10,000 cubic meters per day in the afternoon. The sluice gates were opened at 5 p.m. and regulator gates closed, and the spring freshet of the Yung Ting Ho was diverted into the settling basin. On March 21, its silt content reached 204,000 cubic meters per day. On April 11, the rate of discharge of the Yung Ting Ho became 30 cubic meters per second with a silt content of 0.7 per cent by weight. The diversion was therefore stopped. The total inflow into the settling basin is about 180,000,000 cubic meters, and the total silt deposition is about 1,100,000 cubic meters.

The result of these two diversions has proved to be quite satisfactory, and the success of the Palliative Scheme is warranted. There is an increase of depth in the Hai Ho following each diversion, and the Hai Ho is at present good for a draught of nearly 15 feet at ordinary high water. It is expected that the Hai Ho will continue to improve and will not be subject to occasional set-backs, as it did whenever there was an inrush of silt too much for it to digest, as long as the Hai Ho Palliative Scheme is in proper operation.

Canton Improvement

The Municipal Bureau of Public Works at Canton announces that the Wah Yik Company, the contractors for the building of the Bund at Honam, have commenced operations. The completion of the whole Bund is expected to take three years.

The Bureau also announces that a number of houses in the city, whose maloo building assessments are still unpaid, will be rent out to the public by the Bureau so that the rents received may be used to pay up such assessments.—*Canton Gazette*.

Ruby Mining in Upper Burma*

By J. COGGIN BROWN, D.Sc., M.Inst.M.M.

(The author deals with the history of the industry and describes the geology of the deposits, the mineralogy of the gemstones, and both native and European mining methods, concluding with a discussion as to prospects)

GEM mining in Burma, in areas which have been notified as "stone tracts," is not governed by the rules applicable to ordinary minerals, but by the provisions of the Upper Burma Ruby Regulation of 1887. There are four of these stone tracts in Burma proper and three in the Federated Shan States. The former include the Mogok Tract and areas within the Thabeitkyin township of Katha district ($22^{\circ} 53' : 96^{\circ} 1'$); around Naniazeik in Myitkyina ($25^{\circ} 37' : 96^{\circ} 37'$), and near Sagyin ($22^{\circ} 17' : 96^{\circ} 7'$), 16 miles north of Mandalay (Fig. 1). Besides the ruby, sapphire, and spinel, for which the country is renowned, Burma produces many other precious and semi-precious stones, including the gem varieties of the following minerals:—Quartz (amethyst, etc.), apatite, beryl (aquamarine), chrysoberyl, epidote, garnet, iolite (water sapphire), jadeite, lapis lazuli, feldspar (moonstone), olivine (peridot), phenacite, tourmaline (rubelite), topaz, and zircon (jacinth).

The Mogok Stone Tract

The observations which follow refer entirely to conditions in the Mogok Stone Tract, for no mining has been attempted in any of the others for many years and their exploration has not been particularly encouraged.

The Mogok Tract occupies an area of over 600 square miles of mountainous, deeply-dissected, and for the most part forest-clad country in the Mogok Township of Katha District, on the east of the Irrawaddy. Geographically it forms part of the Shan Highlands. Geologically it is made up of gneisses and associated rocks of Archæan age, amongst which are the bands and masses of crystalline limestone from which some of the gems have been shed into the detrital and valley deposits whence they are now won. These Archæan rocks probably extend through the Mongmit State on the north and join with similar strata known to occur in the hills which form the Burma-China frontier region between Bhamo and Têng-yüeh.

Mogok ($22^{\circ} 55' : 96^{\circ} 33'$), a town of about 10,000 inhabitants, all of whom are dependent on the gem industry, is connected by a motor road, 60 miles long, with Thabeitkyin, a river port, 70 miles north of Mandalay. From Thabeitkyin, at 200 feet, the road gradually rises in an easterly direction, attaining an elevation of over 5,000-ft. above sea-level before descending to the Mogok valley at approximately 4,000-ft. This is a picturesque locality, surrounded by lofty mountain ranges, culminating in Taung Me, 7,544-ft., to the north. The climate is good, malaria and the tropical epidemic diseases are rare, and the rainfall averages about 100-in. per annum. The local labor forces are augmented by abundant transfrontier Maingthas and Yunnanese Chinese during the open season. Mining in recent years has been restricted to an area in the east of the tract, approximately 20 miles across from east to west and 10 miles from north to south. Important subsidiary centers in this are Kathe, eight miles, and Kyatpyin, 10 miles west of Mogok on the main road (Fig. 2).

Early History

The earliest reliable Burmese reference to the mines is in a royal edict of the contemporary monarch dated A.D. 1597, which proclaims that Mogok and Kyatpyin, until that time part of the territories of the Shan State of Mongmit, should thereafter be included in the Burmese realm, the Shan State being granted the town of Tagaung in exchange. The document naively adds—"The officials concerned must take over the rubies, with a list of all descriptions, big and small, and pay into the Treasury."

It is evident from this edict that at the time ruby mining was an established industry and the date of its foundation is likely to remain unknown. Many of the early European adventurers in the

East knew of Burmese rubies and interesting historical details occur in the writings of Santo Stefano (15th century); Ludovic di Varthema, who visited Pegu in 1496; Duarte Barbarosa (1501-16); Cæsar Fredericke (1569), and the London merchant Ralph Fitch (1586). Fredericke, who resided in the Burmese capital for some time, states that one of many titles of the king was "Lord of the Mines of Rubies, Safyrs and Spineles," while his account of the methods of the ruby brokers might have been written of the native gem bazaar in Mogok to-day. According to Fitch, rubies were so abundant in Pegu "that they know not what to do with them, but sell them at most vile and base prices."

The kings for obvious reasons shrouded the mines with the greatest secrecy possible and it was not until 1833 that Père Guiseppe d'Amato was the first European to visit them. At Kyatpyin he found square shafts, 20 or 30 feet deep, sunk to the gem-bearing gravel below the valley floor, lateral galleries being sometimes made from them, but the influx of water soon caused their abandonment and the sinking of new ones. Besides rubies and sapphires, topaz and oriental emeralds were then being found and spinels were abundant.

A proclamation by a later king, dated 1783, exists. It extended the boundaries of the tract and they continued to be enlarged until at the time of the British Annexation in 1886 they enclosed their present area.

The best stones were always regarded as the perquisite of the kings. Thus Father Sangermano, an Italian priest who lived in Ava between 1783 and 1806, wrote as follows:—"It is the rubies of the Burmese Empire which are its greatest boast, as both in brilliance and clearness they are the best in the world. The Emperor employs inspectors and guards to watch the mines and appropriates to himself all the stones above a certain weight and size; the penalty of death is denounced against anyone who conceals, or sells, or buys any of these reserved jewels."

During the reign of King Mindon Min (1855-1898) the governorship of the Stone Tract was auctioned to the highest bidder and the latter's payment in silver to the royal treasury gave him the

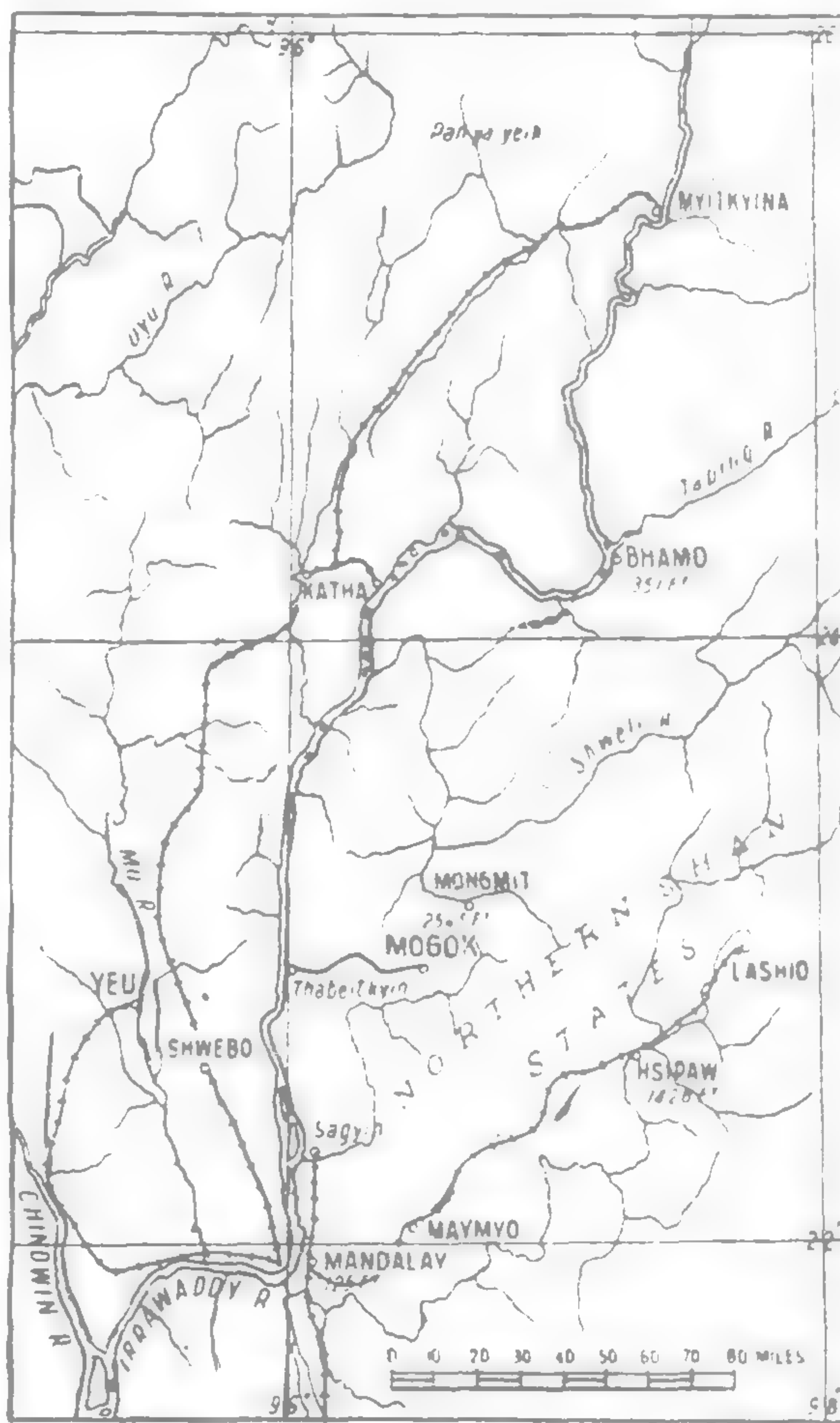


Fig. 1.—Sketch Map of Upper Burmah to show Ruby Localities

*The Mining Magazine

sole right to purchase gems. A race of hereditary miners had in the meantime evolved, partly from prisoners of war banished to the mines by various kings. Their descendants, carefully enumerated and registered, are the only natives permitted to mine in the tract at the present time.

It is necessary to describe very briefly the conditions ruling at the time of the annexation, not entirely as a matter of history, for, modified in accordance with British ideas of equity, they formed the foundation on which the Upper Burma Ruby Regulation of 1887, the existing law, was laid down. The Stone Tract then formed part of the private estates of the Burmese kings, managed directly on their behalf at first and at a later date farmed out for what it would fetch. King Mindon is believed to have received about one lakh of rupees per annum from this source of revenue. King Thebaw, the last of the Burmese monarchs, undoubtedly obtained a larger sum, but his attempt to raise it to two and a half lakhs of rupees nearly ruined the industry.

The local officers, or "so-thugyis," as they were called, were given a free hand both as to the total revenue raised and the methods employed in its collection, so long as the lessee's demands were met. The latter possessed an option to buy all gems found by the miners, except those reserved under the royal prerogative. In cases of disagreement regarding valuation the stones were sent to the ruby mart at Mandalay to be sold for the owner. He in the meantime had to pay the "Seal Tax," buy an export permit, deposit 25 per cent of the estimated value of the parcel—which, needless to remark, was pocketed by the lessee—and run the risk of the gems being stolen on their way to the capital. The lessee also collected a house tax from the miners and levied an irregular cess at times suitable to himself. In addition to all this he augmented his income by monopolistic money lending, by imposing rates on the local produce markets, and by auctioning out the gambling saloons at the mines. Exorbitant taxation of every conceivable form and perpetual harassments of the kinds described could have but one end, expressed in a few words many years ago by a British officer who was well acquainted with the situation in the following sentence:—"Had it not been for the annexation taking place about that time the Stone Tract would have been almost deserted."

European Development

Mogok was occupied in December, 1886. In October, 1887, the Ruby Regulation came into force. It empowers the Government to notify the boundaries of the stone tracts and to make rules regarding the mining, cutting, possession, buying, selling, and carrying of precious stones. Under one clause, 5 (2), a licensed miner is compelled either to (a) sell at his own valuation to the lessee all the gems he may find or (b) pay on that valuation to the lessee such duty as the Government may direct. Here we find embodied the chief privilege of the lessee under the Burmese regime.

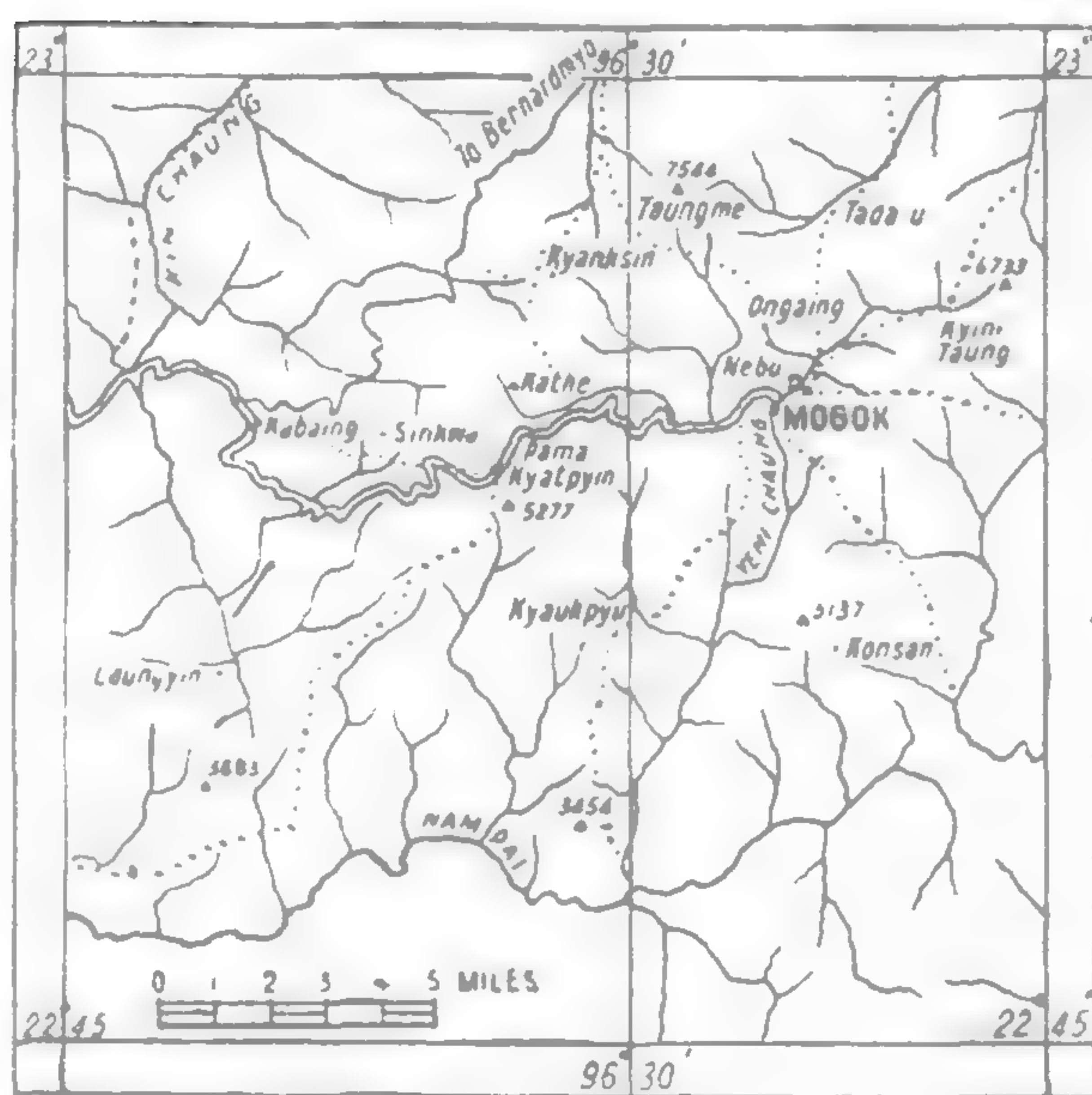


Fig. 2.—Sketch showing the Eastern end of the Mogok Stone Tract

time, this latter alternative has functioned, for without the arbitrary compulsion of the Burmese officialdom it proved impossible to force the miners to adopt the other course. The lessees then collected the rents brought in by the miners and organized their own staff to supervise them. The lessees were also granted an exclusive right to mine for gems by any method they liked to adopt in unoccupied lands not reserved by the Government for the native miners. Their hereditary rights, then as now, have always been rigorously safeguarded. For these and other privileges the lessees agreed to pay a rent of Rs. 4 lakhs per annum and a further sum of one-sixth part of their net annual profits to the Secretary of State for India.

The Burma Ruby Mines, Ltd., was floated on February 27, 1889, with a capital of £300,000 amidst scenes of extraordinary enthusiasm in St. Swithin's Lane, but the usual crop of unforeseen difficulties, inherent in the introduction of Western methods into Eastern jungles, was encountered and it was not until 1895 that profits were made and 1898 that the first dividend of 5 per cent was paid. Meanwhile, in 1890, important changes affecting the native miners were introduced. Instead of the royalty charge levied on the mines a monthly fee of Rs. 20 per workman employed was now adopted, payable, of course, to the company. Restrictions on sales were also removed and an open gem market was instituted. Both these arrangements persist to the present time.

A second lease was granted in 1897 for a period of 14 years at an annual rent of Rs. 3,15,000 plus 20 per cent of the net profits, but this was again modified in 1899, when the rent was reduced to

Rs. 2 lakhs, the share of the profits payable to the Government raised to 30 per cent, and certain outstandings remitted. A new clause in this lease granted an absolute right to a mining licence to any member of a family resident in the tract before the advent of the company. In 1897 the capital of the company had been reduced to £180,000.

Ruby mining by European methods now entered a profitable phase. For the six years 1898 to 1903 inclusive the average annual value of the stones obtained was £89,345 and the average annual



Fig. 3.—View looking South-West down the Mogok Valley

dividend just over 11 per cent. Royalty receipts from the native miners, the value of whose output is not included above, varied between £12,765 and £23,460 per annum in the same period.

A third lease was granted for 28 years from April, 1904, on much the same terms as the 1899 arrangement. Prosperity continued until the autumn of 1907, when the demand for rubies temporarily ceased following a severe financial crisis in America. During these times the company found employment for over 2,000 workers. Royalties fell from £19,340 in 1907 to £8,050 in 1908, a striking testimony to the effect of the depression on the native industry. This slump was long continued and its effects were probably accentuated by the competition of synthetic stones in the jewel markets of the world. It has been stated that the combination of these two circumstances caused the price of fine two-carat rubies to fall from Rs. 200 to Rs. 60 per carat, while the lower grades showed a greater fall. Slightly better trading conditions resulted in small dividends to the shareholders in 1911, 1912, and 1913 and had not the Great War then intervened the industry would probably have flourished again. The value of the company's finds which averaged over £84,000 per annum during the period 1904-1908, fell to £63,272 between 1909 and 1913 and then to £41,817, the average amount for the years 1914 to 1918.

The accumulated rent arrears due to the Government totalled nearly £24,000 in 1909 and in that year the Secretary of State sanctioned the postponement of their payment and agreed that the company should henceforth make over the royalties collected from the native miners instead of the fixed annual rent, less 10 per cent commission. In 1913, on the understanding that £20,000 should be expended on the development of new areas, the Government agreed to remit the debts, with the stipulation that if and when profits exceeded 10 per cent on the paid-up capital half the excess should go towards their liquidation.

At the commencement of the War the European and American gem markets closed down and the Eastern demand slowly fell away. The officers of the company took up military duties and in 1914 the Government made further remissions. The years 1915, 1916, and 1917 all registered losses and the state of the Burmese industry is seen from the royalty returns, which dropped from £23,000 in 1914 to £4,000 in 1916, rising again to £8,000 in 1917. In 1918 the company paid its then outstandings and in 1919 a profit of over £30,000 enabled a small dividend to be paid. The situation, however, never recovered and nothing is to be gained by enumerating the various steps taken in the attempt to retrieve it. In 1925 the company went into voluntary liquidation,

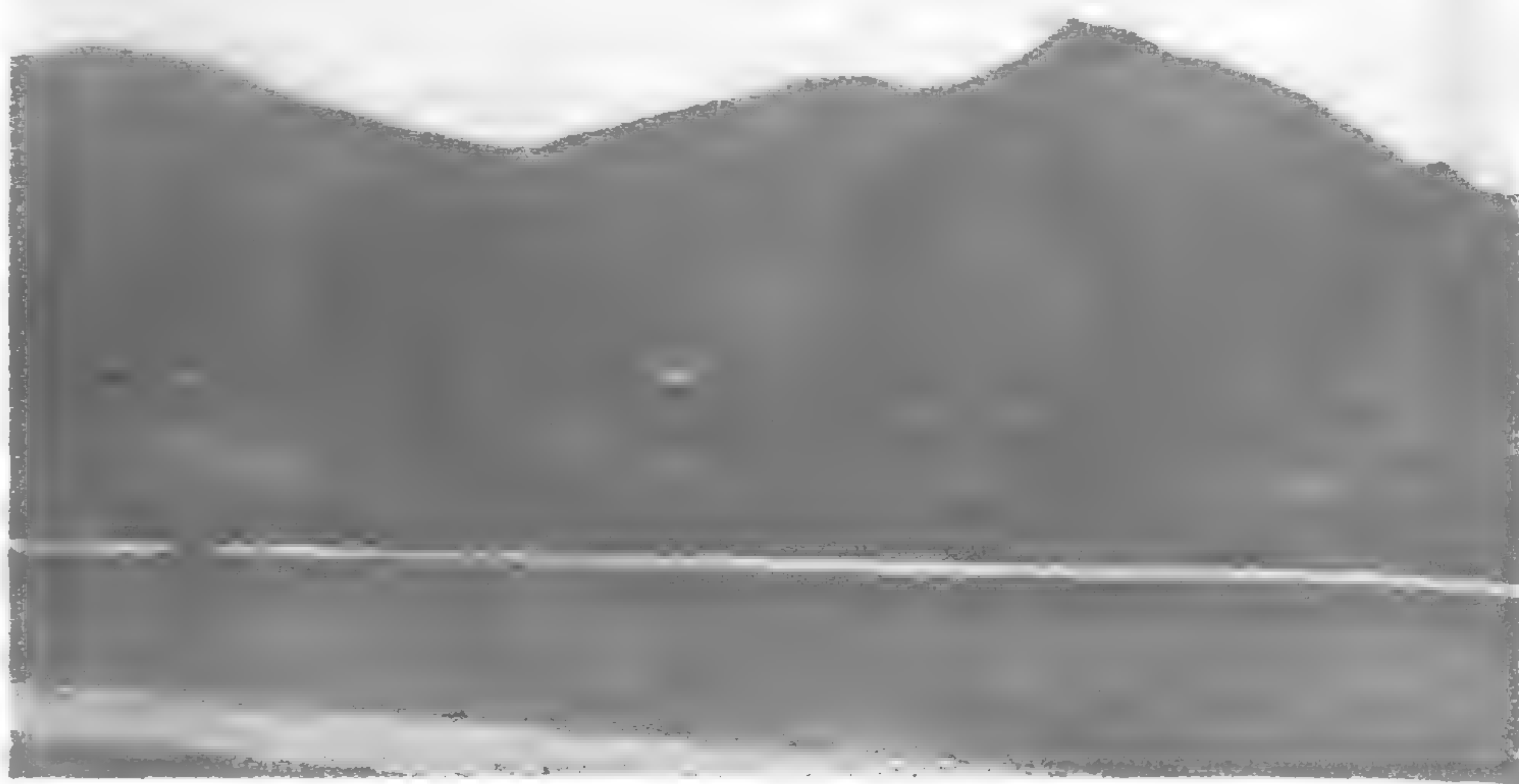


Fig. 4.—View looking North across the Valley, Mogok

unsuccessfully offering the mines for sale in 1926. A skeleton organization continued to work, however, until the lease terminated. Operations finally ceased at the end of June, 1931.

The end of the Burma Ruby Mines, Ltd., if no steps had been taken to meet the position, would have left the large native industry uncontrolled, for the company had managed it on behalf of the Government from the early days. The author was deputed to investigate the industry in 1927-28 and formulated plans for its control and future development. At his suggestion a new large-scale topographical survey of the eastern part of the Tract was undertaken, to form the basis of a modern geological survey, which the writer commenced on the existing maps and handed over to others in 1930. This survey is still in progress. Its objects are twofold. First, to subdivide the crystalline complex into its various sub-groups, to map them separately, to unravel their exceedingly complicated structure, and to come to some conclusion about their origin. The general relationship between the Burmese Archæan rocks and those of Peninsular India will be revealed in the process. Secondly, to map the true distribution of those members of the complex which are gem-bearing. Once this is accurately known, it will be a comparatively simple matter to delineate those portions of the Stone Tract that are favorable for the accumulation of secondary gem-bearing deposits of detrital and alluvial origin. This information is needed for the future guidance of the industry as well as for its administration. Sufficient is already known to warrant the assertion that, important though the ruby and spinel-bearing crystalline limestones are as sources of these stones, the whole story does not end there. The ruby is not entirely confined to the limestones and it is doubtful if the sapphires, of increasing importance in recent years, are derived from them at all. Many of the other valuable stones that the area produces also come from different rock groups and not from the limestones.

Geology

The rocks around the Mogok valley are typical members of the Archæan complex, which occupies the whole of the Stone Tract. Looking downstream towards the south-west from the high round at its head (Fig. 3), both the Kyini Taung-Myo Taung ridge on the left and the two outer ranges on the right, are built up of members of the Mogok Series, a highly metamorphosed, strongly-folded group of sedimentary origin in part. Its commonest representatives are garnet-biotite gneisses, with or without sillimanite, and garnetiferous granulites. The latter are widely spread about Mogok town and yield the local building stone. Excellent sections are exposed in the gorge of the Yeni Chaung, which leaves



Fig. 5.—Washing Floor for Ruby-Bearing Gravel, Enjouk, near Mogok

the valley below the lakes (flooded workings) in the photograph, between Mogok and the power house. Here they are permeated with veins, sheets, and films of aplite and pegmatite, forming typical *lit par lit* injections. Other rocks of this series are augite and calc-gneisses, calciphyres, and crystalline limestones. The calc-gneisses usually contain diopside and sometimes graphite and the common silicates in the calciphyres are diopside, phlogopite, and forsterite, but chondrodite, scapolite, and zircon also occur. The jagged crests in the middle distance on the right of the valley in Fig. 3 are outcrops of calciphyre.

Of more importance from an economic point of view are the crystalline limestones, of which there are at least five large independent masses on the north-eastern side of the valley. They are sometimes pure white and very coarse-grained, oftener medium-grained, carrying flakes of graphite and phlogopite. Rarer varieties are pale blue, pink and yellow. They contain pseudomorphs of forsterite, colorless diopside, tremolite, chondrodite, pyrite, apatite, spinels of many colors, and rubies and they are always slightly dolomitic. Veins of felspar rock and granite pegmatite are frequent in these limestone masses and show the development of interesting minerals at the contacts. Mr. A. K. Banerji, to whom the writer handed over the geological survey, has described the case of a felspar rock intruded into coarse-grained limestone on Sontabe Taung, north-east of Mogok. The vein is from 6 to 8 feet thick and is composed of coarsely crystalline felspar, mostly albite. The only other non-felspathic mineral present is apatite. At the contact is developed a coarse rock made up of nepheline, diopside, calcite, felspar, and apatite. In another case on Myo Taung, four miles east-northeast of Mogok, the contact rock between a thick granite-pegmatite vein and a white saccharoid marble is composed of scapolite, diopside, felspar, calcite, and flakes of graphite.

An acid gneiss, tentatively regarded as intrusive into the Mogok Series, occurs at Kyauknaga ($22^{\circ} 57' : 96^{\circ} 30' 30''$). It is a medium-grained rock, light in color, with abundant quartz and microperthite, a little oligoclase, and brown biotite.

Great intrusions of augite syenite occur in the amphitheater between Kyaukthinbaw Taung and Lennu Taung, the rounded and sharp peaks, respectively visible on the sky line of Fig. 4. A large laccolithic intrusion near the village of Oongain in this amphitheater has caught up bands of limestone within its own substance, with remarkably little alteration to either parent or host. Most of the felspar in the syenite is microperthite, but a little orthoclase and albite are always present too. The pyroxene is either augite or aegirine-augite. The accessories are sphene, apatite, and zircon. In a rare type of the rock the felspars exhibit a remarkable schiller and this material has been worked for moonstones.

Nepheline rocks, very rich in dark minerals and of various unusual types, occur north-west of Chaunggyi ($22^{\circ} 58' : 96^{\circ} 32'$).

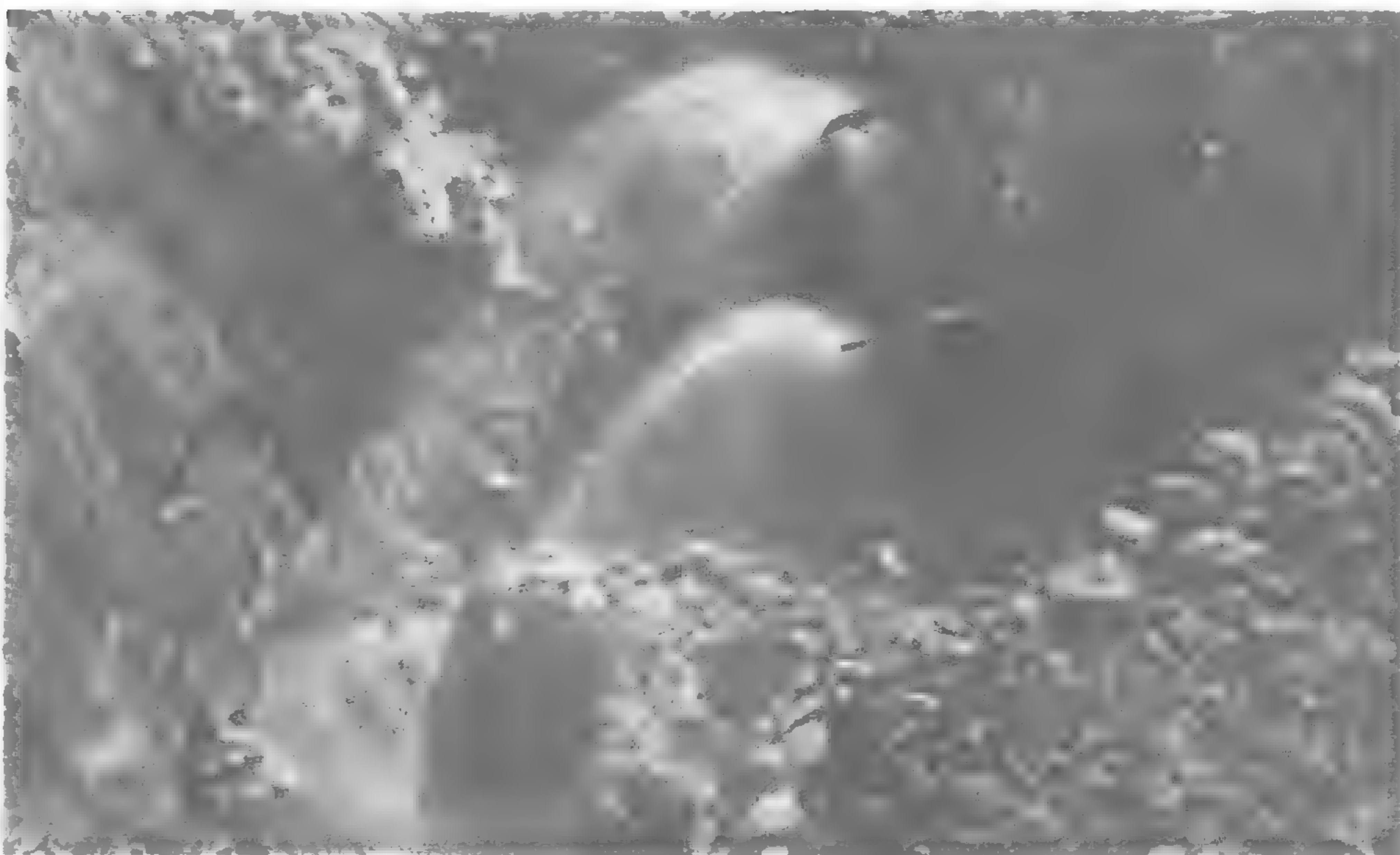


Fig. 6.—Burmese Ruby Working. "Hmyawdwin" type, Yegy, near Mogok

Apart from the special contact effects mentioned above, the interaction, mingling, and subsequent metamorphism of such a large variety of types in so small an area has resulted in many curious hybrid rocks and minerals of great petrological interest.

The strike of the strata at the top of the Mogok valley is north-north-east. Near Mogok itself the pitch of the prevailing folds is east-north-east, while the major feature of the structure hereabouts may prove to be the great syenite laccolith.

To Professor Adams the whole rock suite between Thabeitkyin and Mogok presented a most remarkable and striking resemblance to a section through the Grenville Series in Canada.* According to Dr. Fermor, Director of the Geological Survey of India, it exhibits a grade of metamorphism characteristic of the hypomorphous zone and its only close parallel in the Indian Empire is to be found in the Eastern Ghats Province (Vizagapatam, etc.) and in Ceylon and Tinnevely†

Matrix of the Ruby and Sapphire

Most of the rubies are derived from the crystalline limestone and specimens surrounded by calcspar are not uncommon. The ruby, however, also occurs under other conditions, for the author has seen it crystallized with tourmaline and with other minerals. The sapphire, though of the same chemical composition (Al_2O_3), is not associated with the limestones. Mr. A. H. Morgan, for many years agent of the company in Mogok, gives its matrix as a pegmatite gneiss. Adams describes it as a granular white acid plagioclase intergrown with orthoclase and constituting a micro-perthite‡. The writer has examined many specimens occurring in felspar of this type. The thick veins of felspar in the sapphire mine at Kyaungdwin, near Kathe, may be recalled in this connexion, though the gems won there actually came from the detrital deposit. Banerji found a nepheline-corundum syenite in which the latter mineral was of a blue gem variety§. Such rocks resemble the corundum syenites of Coimbatore (South India), described by Sir Thomas Holland.¶ It is evident that in Mogok, as elsewhere, there are several modes of origin of corundum.

Burmese Rubies and Sapphires

The rubies when they exhibit their crystal forms are practically always combinations of hexagonal prisms and basal planes, sometimes

*F. D. Adams. *Trans. Can. Inst. Min. Met.*, Vol. XXIX, p. 18, 1926.

†L. L. Fermor. *Rec. Geol. Surv. India*, Vol. LXV, p. 85, 1931.

‡F. D. Adams, *Loc. cit.*, p. 26.

§*Rec. Geol. Surv. India*, Vol. LXVI, p. 95, 1932.

¶Sir T. H. Holland. *Mem. Geol. Surv. India*, Vol. XXX, p. 169, 1901.



Fig. 7.—Washing Channel from a Burmese Working of the "Hmyawdwin" type, Yegy, near Mogok

with subsidiary rhombohedral faces and generally of a Tabular habit. Sapphire crystals on the other hand always show steep pyramidal planes, whereas rubies showing them are exceedingly rare. Star sapphires which exhibit a six-rayed opalescent star when viewed nearly in the direction of the principal axis and particularly well when the stone is suitably cut with the curved surface known as *en cabochon* are common. Star rubies are rare. Rubies tend to be small and it is not generally realized what an unusual stone a large and perfect ruby is. Stones about five carats or more are considered important sizes in the trade*. A ruby weighing 10 carats is a most exceptional gem and it is for this reason, coupled with their splendor and referring to specimens as flawless as possible, that the ruby begins to rival the diamond in value when it is about two carats in weight, while above that the ruby greatly exceeds the diamond in price. Large rubies of superb quality are perhaps the most valuable minerals known to mankind. Two stones brought to Europe from Burma in 1875 weighed 37 and 47 carats each, when re-cut the stones weighed 32.3 and 38.6 carats respectively. It is recorded that the smaller stone brought £10,000 and the larger one £20,000†. A stone weighing 77 carats in the rough, found by the company in 1899, was valued at Rs. 4 lakhs (£26,666). A ruby found by A. H. Morgan weighing nine carats sold uncut for Rs. 27,000 and when cut to six carats brought £2,000; one of 21 carats, cut to 13 carats, brought £7,500. Another weighing 36 carats was sold by King Mindon Min for £30,000. The great "Peace Ruby" of 1919, a super-fine stone of magnificent color, weighed 42 carats. Except for a fracture estimated to take away a slice of about eight carats, it was perfect and sold in the rough, on the spot, at Mogok for Rs. three lakhs (£22,500). In October, 1932, the discovery of a fine stone weighing about 30 carats and valued at £7,000, was announced from a native mine in Mogok, while on February 3, 1933, the *Times* stated that a rough ruby, weighing nearly 20 carats, recently found in Burma, had been cut in Hatton Garden to a weight of 7½ carats and was valued at nearly £10,000.

Sapphires attain much larger sizes than rubies. For example, stones of 630 and 293 carats were found at Kathe in 1930, while a specimen weighing 514 carats came to light in a native working at Mogok in December, 1932, but probably the record stone was one found at Gwebin on August 12 of the same year which weighed nearly 1,000 carats. Sapphires are very much cheaper than rubies and medium-sized, first quality stones may be taken to be worth approximately one-tenth of the value of similar rubies.

Burmese Mining

There are three types of native mines. "Loodwins," in which fissures, caves, and hollows in the limestone, filled with detritus from its disintegration, are followed and their contents, often cemented or buried under recent travertine, extracted and washed (Fig. 5). "Hmyawdwins," or excavations driven into hillside detrital deposits which are broken down by water often brought long distances in ditches, the gem-bearing gravel, or "byon," being washed in lengthy ground sluices (Figs. 6 and 7). "Twinlons," unlined pits, or narrow, timbered shafts, sunk in the alluvium of the valleys to reach the "byon" which lies below, the spoil being removed in small baskets by means of balanced bamboo levers (Fig. 8). Major J. F. Halford-Watkins, late Deputy Agent

of the Company, has recently described the native methods of mining, washing, and grading the stones in greater detail than can be attempted here‡.

European Mining Methods

The first operations of the company consisted in the removal of "byon" from Pingutaung, a hill near Kathe, and from Kyaukpyin and Tagaungnandine, near Kyatpyin, and its treatment in machines similar to those used at the South African diamond mines. Work was also started on Kyauktaung, a limestone hill which rises steeply from the edge of the Mogok valley. Attempts to mine for rubies in the limestone of Pingutaung were made between 1890 and 1895, two long adits being driven into the hill. The Panma deposit on the eastern slopes of Pingutaung was also tackled with but indifferent success between 1891 and 1895. Indeed, the early operations of the company in the valleys, like those of the native miner, were greatly handicapped by their waterlogged condition and it was not until A. H. Morgan solved this problem that success was achieved. By sinking a drainage shaft, equipped with pumps, in the Tagaungnandine valley in 1893 it proved possible to strip the 10-12 feet of barren overburden and remove the "byon" to the washing plant on a large scale. Morgan's methods were then extended to the Luda valley and later to Mogok itself, where by 1895 the Shwebontha mine was yielding satisfactory results.

The Mogok valley is an old lake basin and there are two stages of alluvium in it, one an ancient terrace deposit with its base about the level of the recent alluvium, and in the former many of the native "hmyawdwins" are located. The richest layer of "byon" usually laid between 15 to 25-ft. below the surface in the more recent deposit, though sufficient gems occurred in the lower horizons, generally down to the valley floor, to make its removal profitable, provided it could be excavated in large quantities. It is a true rock basin, formerly occupied by a lake, like most of the similar physiographical fea-



Fig. 8.—Ruby Mining by the Pit or "Twin-Lon" method, Mogok

tures in the Shan States and in Yunnan. It is thoroughly waterlogged. Some 10 miles long and two miles wide at a maximum, its drainage presented a bigger problem than the earlier smaller valleys. Steam pumps were used at first, replaced by a hydro-electric installation in 1898, the first of its kind in this part of Asia. By 1901 there were two washing pans working at Shwebontha, three at the Redhill mine close to it, and one at Kyauklongyi, erected in 1898, further north. Another plant with a double pan was situated at Padansho, near Kyauklongyi, and preparations were in progress to start at Chaungzon, at the southern end of the valley.

In 1902 and again in 1908 and 1909 parts of the town were purchased and the people settled elsewhere. Profits were made continuously from 1899 to 1908, except in 1903 when floods damaged the pipe-line and filled the workings with debris. Drainage, however, still continued to be the main trouble and in 1904 Morgan's bold scheme for a drainage tunnel through the rock, 100-ft. below the surface and more than a mile in length was brought forward.

* C. Mathews, "Notes on the Ruby," *Gemmologist*, Vol. 1, No. 4, p. 121, 1931.

† Sir T. H. Holland, "Indian Corundum," p. 60, 1898.

‡ J. F. Halford-Watkins: "Methods of Ruby Mining in Burma," *Gemmologist*, Vol. 1, No. 11, pp. 335-342. No. 12, pp. 367-373, 1932.

Finished in 1908, it was a success from the first, leading the water quickly away, preventing flooding, opening up lower levels of alluvium for exploitation, and freeing power for use elsewhere. Unfortunately its completion coincided with a depressed gem market, a period of restricted output and of rigid economy. (The tunnel was blocked by a fall in 1925 and the valley has now reverted to its prehistoric condition, a series of large lakes filling the old workings.)

After draining an area the ground was removed by open-cast mining. The alluvium, varying from 20 to 70-ft. in thickness and generally lying on a limestone floor, irregular beyond description, was worked in conical bays. The ground was broken down by hand and at a later date by monitors, the high pressure water supply being led from mountain streams often many miles away by elaborate systems of flumes and ditches. Although some layers of "byon" are richer than others, gemstones as a rule occur throughout its thickness and the definite pay streaks of some alluvial metallic minerals of higher specific gravity are unknown. Profits, therefore, depend largely on a big throughput and at each of the mines in the prosperous days over 1,000 tons of material was moved daily. Loaded into trucks, the broken ground was hauled to the washing plants by endless ropeways, though in later years it was entirely treated by monitors and raised to sluice-boxes by means of hydraulic elevators and gravel pumps. According to R. R. Simpson, late Chief Inspector of Mines in India, the average mining cost in 1919 was about eight annas and the value 12 annas per ton, while A. H. Morgan has stated that an average daily turnover of 7,000 tons of earth would yield good dividends when an average value of eight annas per ton was recovered.

Treatment of the Gravels

The object of the sluicing and pan treatment was to produce a clean gravel concentrate from the clayey earth, or "byon," from which the rough gems could be picked out by hand. From the gravel pumps and elevators the material went through screens, the clean oversize after breaking and casual inspection going to the dumps; the smaller stuff (2-in. cubes maximum) passed into a long sluice-box fitted with riffles at proper intervals. The concentrates from this went to the sorting houses.

The hand-dug material, after passing through screens and trommels, was fed into circular pans with revolving arms, the overflow carrying away the lighter sand and mud and a concentrate remaining behind. This was sized through appropriate trommels in the sorting houses and sizes over $\frac{5}{8}$ -in. went direct to the picking tables. The fines were passed on to pulsators to obtain as close a concentration as possible, but the large quantities of ilmenite, garnet, and valueless corundum prevented a very select separation. The first sorting was done by Europeans and the later ones by trained natives under strict supervision and fitted with headgear designed effectively to stop the easy road from hand to mouth.

A curious local custom, known as "kanase," permits women to work without licences in stream beds, tail races, and dumps from mines and washeries and to keep any gems they may discover as their own property. The writer has seen upwards of 50 women and girls sorting rejected gravel on the dumps of the old Red Hill washer near Mogok, but it is doubtful if they earn more than a few annas per day.

Hydraulic Developments

About the beginning of the War period it was becoming clear that the portions of the Mogok valley hitherto worked by the company were approaching exhaustion; working costs were also increasing as the distances between the faces and the mills lengthened; the market, too, was falling. New ground was opened up at Kathe in 1914, where large scale drainage and stripping operations had commenced two years earlier. A mine was started at Saza-in in 1916. The Kyaungdwin valley, near Kathe, was also tapped about this time and was one of the last areas working in 1928. It lies on a contact of limestone with biotite schist, intruded by felspathic veins of pegmatitic origin, and contained rich but deep-lying "byon," remarkable for the size and beauty of its sapphires. Other areas worked during this period, mainly by hydraulic sluicing arrangements, were Datangataung and Panma, near Kathe, Enjouk,

near Mogok, and Bernardmyo, 11 miles north of Mogok, long known as a region yielding sapphires and peridot.

Future Prospects

It is in the more extended application of intensive hydraulic methods that most hopes of success are centered, if ruby mining is ever attempted again on a large scale by capitalistic enterprise in this Stone Tract. Many adverse causes have contributed to the existing depressed condition of Burmese ruby mining and most of them will suggest themselves to the reader. Exhaustion of the gem-bearing deposits of the tract as a whole is not, in the author's opinion, to be numbered amongst them.

The operations of the Burma Ruby Mines, Ltd., apart from early abortive attempts to mine gems in the parent rock and a few experiments on certain hill slopes, were in the main confined to removing and washing gravels from valleys in the neighborhood of Mogok, Kyatpyin, and Kathe. There are, however, other valleys in the Stone Tract (an expanse of over 600 square miles, with bands and masses of crystalline limestone throughout its extent), and in particular those of the Kin and Khabine streams, in which gems occur and which merit further exploration, with the object of proving their potentialities as hydraulicking propositions rather than as territory to be exploited by slow and costly methods of hand removal. The greatest possibilities for the future, however, lie, the writer thinks, in the mass treatment on such lines of the hill-side deposits and a stretch of country known as the "Western Slopes" seems to be worthy of more than passing attention. This lies on the western side of the ranges between Bernardmyo and Kathe and if the remains of small, scattered native workings are any criterion it is a gem-bearing region of great extent. Moreover, it has been stated that water can be brought to it by the cutting of a ditch from Bernardmyo, a long channel surveyed under Mr. Morgan's direction in 1924, the construction of which was not undertaken before the company went into liquidation.

The market for rubies is a world-wide one and, although the company put vast quantities of stones on the market, in times of prosperity no difficulty was apparently experienced in selling them, though fine stones of great price naturally took longer to find a purchaser. The small stones which form the bulk of the output were sold in Calcutta, Madras, or Bombay or auctioned at the mines in parcels to brokers and dealers from various parts of the East. These in their turn passed the stones on to others or to the local cutters and middlemen, whence they reached the jewellers of the bazaars or the travelling pedlars, who distributed them in all directions. The better stones were sold in London, whence they satisfied the home demand and were sent to various Continental and American centers. Representatives of the great jewel establishments of Paris and New York were permanent residents in Mogok until a very short time ago.

The trade, of course, is peculiarly sensitive to economic conditions. "The production of precious stones has always been a good business barometer."* The existing depression in the industry will not lift until the general purchasing power of the world begins to function normally again. If it be true that history repeats itself, there will then arise a renewed demand for luxuries such as the ruby, for it is a characteristic of the human race from prehistoric times onwards that increasing possessions and more lavish feminine adornment proceed together.

It is a fact that the market has suffered from the competition of synthetic stones, but these are distinguished easily enough by the initiated and the discriminating buyer may be relied upon to prefer the natural article.

To-day the native miner works alone again as he did before the advent of the company. The revenue received by the Government of Burma hereafter in licence fees will be a sure indication of the fluctuations of the industry in response to the vagaries of the market, provided a strict check is kept on illicit operations, but the figures will furnish no idea whatever of the actual value of the gems recovered.

The writer wishes to thank Dr. L. L. Fermor, Director, Geological Survey of India, for permission to publish this article and its accompanying photographs, which were kindly supplied by his colleague, Mr. A. K. Banerji.

* S. H. Ball. "Historical Notes on Gem. Mining," *Econ. Geol.* Vol., XXVI, p. 699, 1931.

The Rembau-Coast Water Supply, Negri Sembilan*

THIS supply embraces, as its name implies, part of the district of Rembau and the coastal area of Port Dickson.

Port Dickson is a district on the coast of Negri Sembilan, north of the territory of Malacca, in the Malay Peninsula. It is a small port with a railway loading jetty, the terminus of a branch to the main line at Seremban, the Capital of the State, 20 miles away. The anchorage however is an exposed one, and as a commercial port its importance is perhaps decreasing, such traffic as there is being of small coastal steamers and native craft.

The main attraction of Port Dickson is a sandy beach stretching some eight miles to the south, the only sea-beach of any extent in the center part of the peninsula on the West Coast. It formed at one time the only convenient health resort for the Western inhabitants of the Federated States, but now has to face the competition of the Hill Stations. Government Sanatoria and private bungalows lie dotted down the coast: a training camp for the Volunteer Forces with permanent buildings exists, in which the

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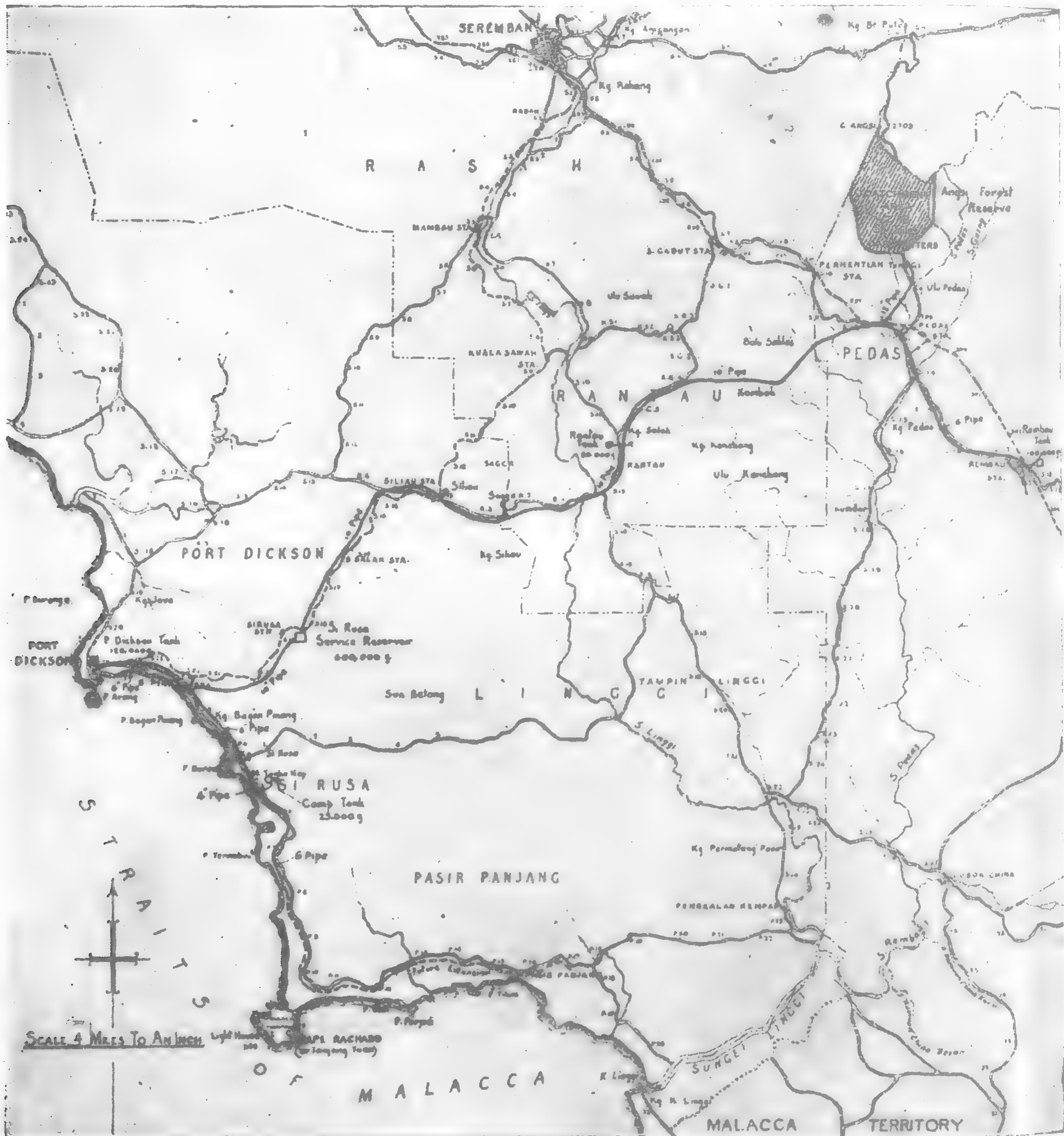


Fig. 1.—Key Plan of Rembau Coast Water Supply

experimental Company of the Malay Regiment is now stationed, while Government has recently acquired further tracts of land in extension of this training area as possible sites for increased accommodation and for an aerodrome.

The 1931 population of the area served was estimated at 15,000 of which 3,500 was in Port Dickson Town.

This coastal belt is one of the driest in the country and has an average rainfall of 80-in. only, compared with some 95-in. elsewhere.

This may be due to its proximity to the Muar-Malacca area where occurs the phenomenon of a distinct change in the character of the monsoon seasons. A short distance inland normal conditions are soon re-established.

In this coastal belt not only is the total rainfall low, but such rains as do occur are in the form of spasmodic heavy storms at infrequent intervals, with very dry intervening periods. There is a distinct dry season from January to March, which extends in a less severe form to September.

Water Supply

Water has been obtained hitherto from shallow wells, reasonably pure in the rural areas, but not so where the population is more dense, and it contains much iron. These wells used to become dry during the early part of the year, and much anxiety was always caused during these months to those responsible for the supply, which invariably had to be rationed, and also augmented by water transported by rail and lorry. The public supply in Port Dickson town was six gallons per head per day, distributed for two hours a day, falling to 1½ gallons per head in times of drought, which latter was distributed for one hour per day under police supervision.

Many investigations for an augmented supply were made but no inexpensive scheme could be devised, and the more expensive schemes for the use of local water had the disadvantages of impurity or of possible inadequacy.

It was decided therefore to bring mountain water to the Coast, and to include in the area supplied various subsidiary centers of population which were also greatly in need of water.

In 1930 investigations were sufficiently advanced to design a scheme for the supply of 600,000 gallons per day from Sungei Beringin, Gunong Angsi, a distance from the Coast of 23 miles. Work started in 1932 and is now practically completed.

General Scheme

Fig. 1 is the key plan of the scheme, and on it are shown the positions of :—

- (a) The Catchment area at Gunong Angsi
- (b) The Dam
- (c) The Filters
- (d) The supply main to Si Rusa Reservoir
- (e) The Si Rusa Reservoir
- (f) The delivery main to, and up and down, the Coast
- (g) The subsidiary supplies, each with its Service Reservoir, at Port Dickson Town, the Camp and Rantau
- (h) The Rembau supply with its separate main and reservoir.

Fig. 2 shows in tabular form the details of the designed draw off and loss of head. Consumption was calculated at 40 gallons per head, except in certain rural areas where only 20 gallons were allowed. The discharge of the pipe was estimated on the Hagen Williams formula for pipes 15 years old.

| Pipe dia. | Draw off g.p.d. × 1,000 | Quantity passing g.p.d. × 1,000 | PORT DICKSON WATER SUPPLY DISTRIBUTION FIGURES <i>Hagen Williams Formula, 15 years old pipes</i> | | Length feet | Head lost feet | P. L. Hyd. Gradient |
|-----------|-------------------------------|---------------------------------------|--|---------------------------------|-------------|-------------------|------------------------|
| 10-in. | — | 600 | | Supply | | | |
| 10-in. | — | 600 | | Impounding Reservoir | — | — | 415.0 |
| 12-in. | 6 | 594 | | Filters | 450 | 22.0 | 393.0 |
| | | | | Ayer Angkat Estate | | | |
| | | | | 12½ M. Main Road | 9,000 | 10.0 | 383.0 |
| 6-in. | 75 | 519 | To Rembau Tank (100,000) | | | | |
| 10-in. | 3 | 516 | | { Batu Sablas Estate | 28,270 | 56.5 | 326.5 |
| | | | | { P. Tinggi Estates | | | |
| | | | | { Kombok Estate | | | |
| 10-in. | 9 | 507 | | { Ribu Estate | 10,900 | 21.5 | 305.0 |
| | | | | { Takau Estate | | | |
| | | | | | | | |
| 4-in. | 38 | 469 | To Rantau Tank (50,000) | Rantau Village | — | — | 305.0 |
| | | | Sagga Tank (5,000) Siliau Tank (5,000) | { Linggi Estate | 53,055 | 86.0 | 219.0 |
| | | | | { Linsum Estate | | | |
| | | | | { Sagga Village | | | |
| 10-in. | 19 | 450 | | Siliau Village | — | 10.0 | 209.0 |
| — | — | 450 | | Atherton Estate | | | |
| | | | | Leigh Estate | | | |
| | | | | S. Salak Estate | | | |
| | | | | Si Rusa Reservoir | | | |
| Total | 150 | 450 | BALANCING RESERVOIR | | 101,675 | 206.0 | 209.0 |
| | | | DELIVERY | | | | |
| 10-in. | — | 450 | | Si Rusa Reservoir | 17,300 | 27.0 | 182.0 |
| 10-in. | 8 | 442 | | Power Station | | | |
| — | — | 442 | | St. Leonards | | | |
| | | | | Coast Road | — | — | 182.0 |
| | | | NORTH | | | | |
| 6-in. | 6 | 250 | P. Dickson Tank (120,000) | Bungalows | 12,700 | 80.0 | 102.0 |
| 6-in. | 244 | — | | PORT DICKSON TOWN | | | |
| | | | | | | | |
| | | | SOUTH | | | | |
| 8-in. | — | 192 | | Bungalows | — | — | 182.0 |
| 8-in. | 43 | 149 | | Bagan Pinang Village | | | |
| | | | | | | | |
| 4-in. | 25 | 124 | Camp Tank (25,000) | Camp | 15,000 | 14.0 | 168.0 |
| 6-in. | 21 | 103 | | Bungalows | 15,000 | 23.0 | 145.0 |
| 6-in. | 13 | 90 | | | | | |
| | | | | | | | |
| 6-in. | 90 | — | P. Panjang Tank (50,000) | P. PANJANG VILLAGE (future). | 43,900 | 51.5 | 93.5 |

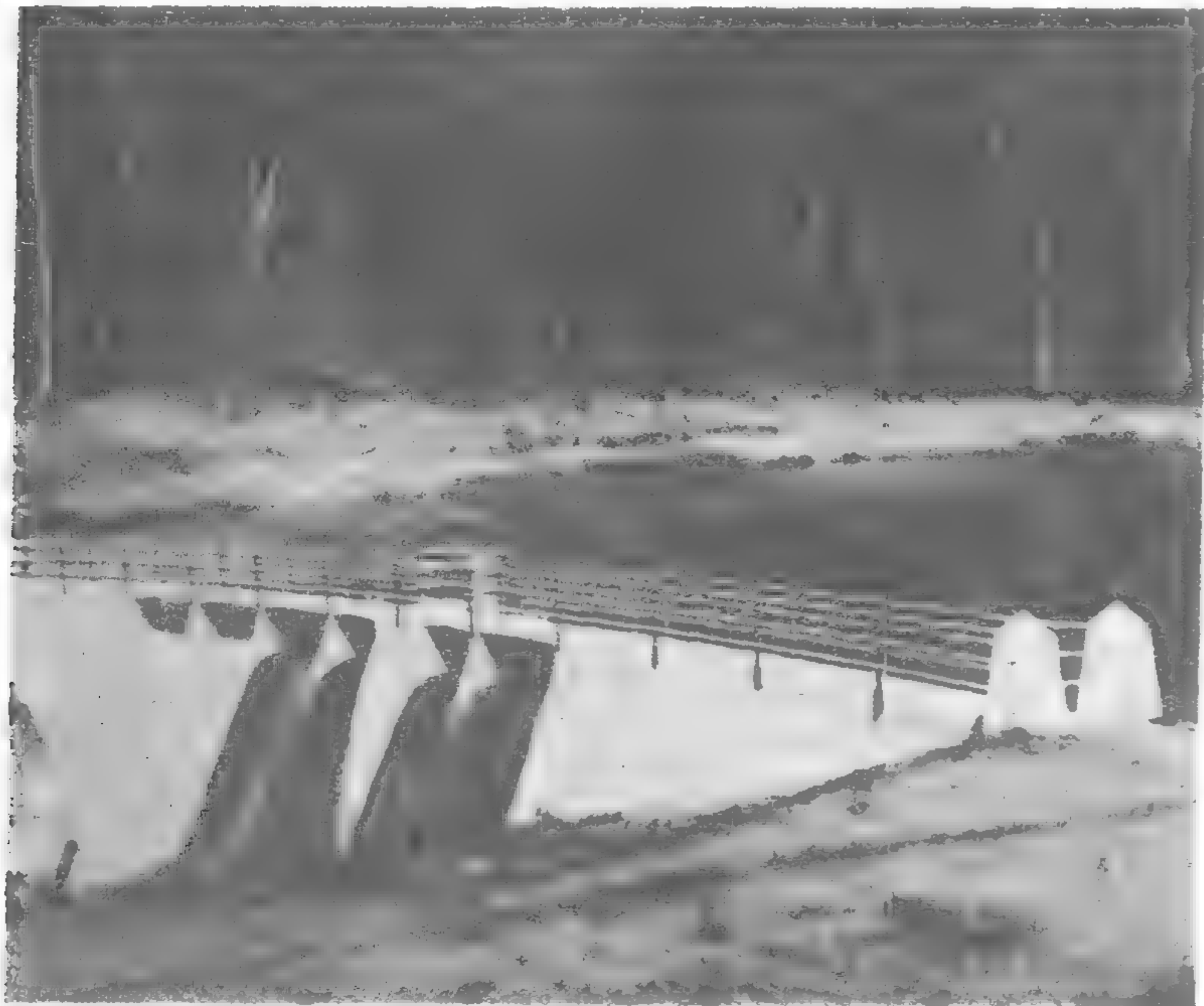


Fig. 3.—Sungei Beringin Dam

The supply being one of an area and not to a terminus only, private connections were permitted direct to the delivery main, but only for supplying storage tanks of, at least, 24 hours capacity. These tanks for the larger supplies are already installed, but, in order to encourage such connections their installation on small supplies is not at present compulsory.

The Catchment

The catchment area is 1,400 acres and consists of Forest Reserve in virgin jungle, feeding the Sungei Beringin. The top water level of the impounded water is 415-ft. above M.S.L., and from this the ground rises steeply, covering a regular and compact oval area, to the Government Sanatorium which lies on the boundary of the catchment near the summit of Gunong Angsi at 2,700-ft. above M.S.L. Bedrock is a coarse granite, and the water obtained is of the soft and somewhat acid character common to areas of this nature.

The normal flow of the stream is three to four million gallons a day, and the lowest flow measured over a period of four years is 1½ million gallons, which is double the required delivery. Similar areas elsewhere have given a drought discharge equivalent to 400,000 gallons per day, but it is not anticipated that this area will ever yield less than the daily supply except for a very short period.

The Dam

The Dam is a mass-concrete gravity structure arched to a radius of 250-ft. It has an overflow spillway 50-ft. long with 4-ft. free-board, sufficient to pass double the estimated maximum storm flow. It impounds 10½ million gallons of water, which has a top surface area of eight acres, and a depth of water at the outlet of 15-ft.

Two 24-in. diameter scour gates are provided for use in emergency and for keeping the reservoir free from sand, which is brought down in abundance. Water is drawn off at either of two levels through a 14-in. pipe in a tower.

The dam is founded on solid granite throughout, in which three fissures were found running diagonally across the dam. One of these was sealed by grouting at 300 lbs per square inch pressure, whilst the remaining two, which were in less important places, were piped up to stream level and led into the open to prevent upward thrust. Other pipes were inserted to indicate upward thrust or seepage, but neither has been found to exist. There is no rendering or facing; the concrete, which is 8 : 1 mix, is as stripped from the forms and is bone dry except for a little visible joint seepage.

The following details may be of interest :—

Maximum height of Dam 25-ft. 6-in.

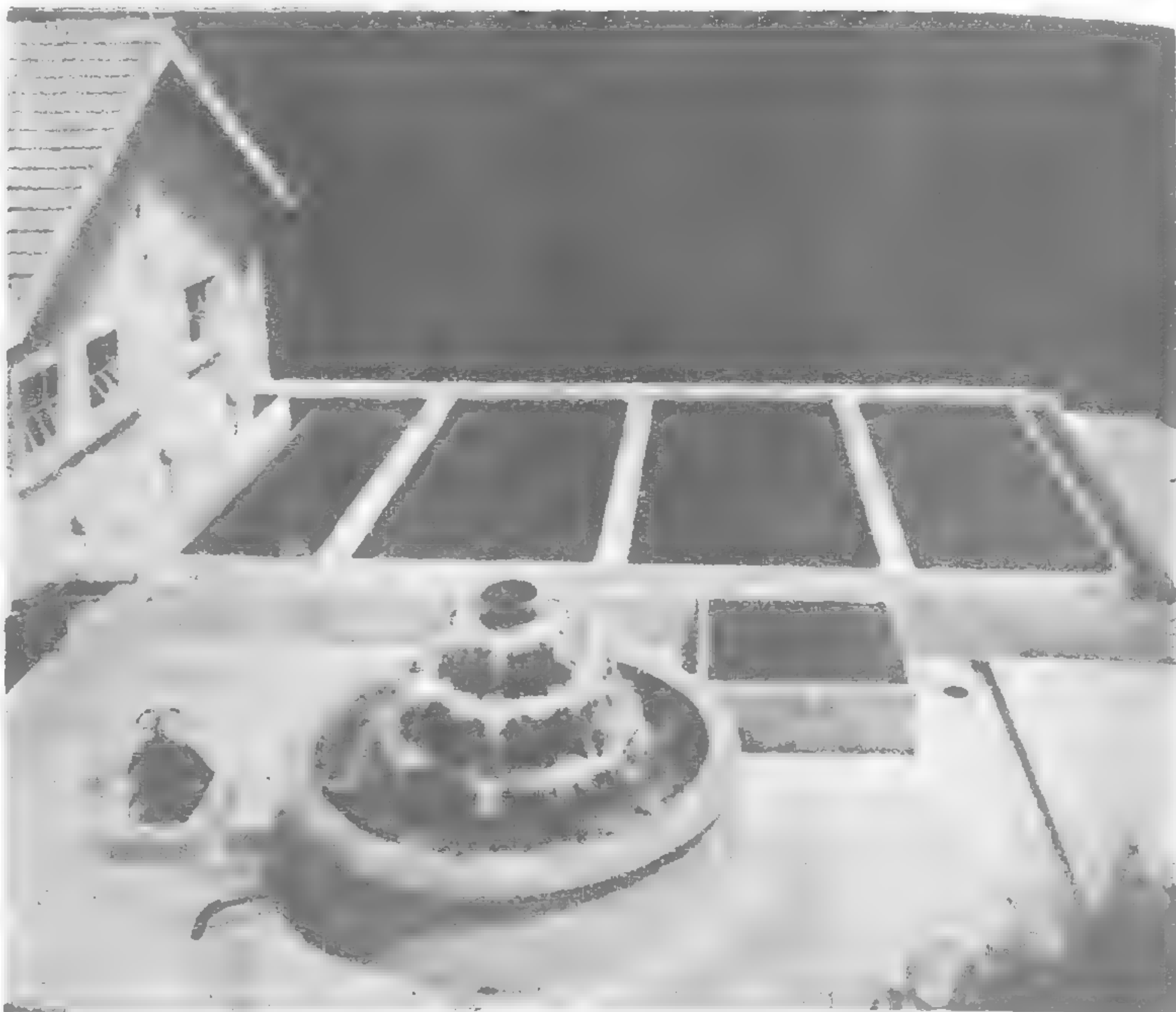


Fig. 4.—Sedimentation Tank and Aerator

| | |
|--|-----------|
| Concrete, cubic yards | 1,200 |
| Total cost including clearing storage area. .. | \$ 30,400 |
| Cost per million gallons, dam structure only .. | \$2,650 |
| Cost per cubic yard of concrete, including excavation and all work, but excluding pipes and other fittings | \$21.50 |

The work was completed in nine months from the date of commencement.

Filters

From the Dam the water flows through 400-ft. of 10-in. pipe to the Filtration Plant. The Filters are Paterson Engineering Company open-top gravity mechanical type, cleansed by air-scour and reverse flow wash water.

The design was required to take into consideration the following :—

- (i) Rate of filtration 80 gallons per sq. ft. per hour
- (ii) Water already fairly clean and pure although acid
- (iii) Total flow likely to vary and initial flow much below capacity
- (iv) A steel pipe line 20 miles long following the filters
- (v) Site difficult of access and no external power available
- (vi) Operators semi-skilled Asiatics with intermittent skilled supervision.

and these requirements necessitated a design in which sizes, capacities and rates had to be generous : simplicity had to be of greater importance than an accuracy which might involve complication : operations had to be automatic or semi-automatic when this did not affect the simplicity ; a long washing interval was desirable in order to obviate night labor.

It is hoped that, by a complete and careful layout these various aims have been achieved.

A bye-pass leads from the main pipe to the splash-type fountain aerator which is provided with three tiers of trays. The supply to the aerator is controlled by the rate of draw-off from the filters by means of a float valve. The aerator serves to precipitate the colloidal iron and liberate any carbon di-oxide which may be present.

From the aerator the water passes to a channel, where it flows over a weir which controls the rate of supply of the two chemical reagents, Soda Ash and Sulphate of Alumina, which are stored in mixing tanks in the Chemical House, the rate of dosage being governed by needle valves. The Chemical dosage apparatus is in duplicate. These solutions are added to the raw water at the weir, and the whole flows along a baffled concrete channel running alongside the Sedimentation Tank, and into a delivery channel at the upstream end of the latter.

The Sedimentation Tank is an open tank of Reinforced Concrete, 40-ft. by 24-ft. by 14-ft. deep, containing 70,000 gallons. This tank is divided by three vertical baffle walls into four compartments and the water flows under, over and under the baffles, and finally discharges into a surface channel at the filter-house end. Each compartment has a steep "vee" shaped floor, at the bottom of which is a perforated sludge pipe which passes through the wall and into an exterior sludge channel, where it is closed by a valve. When the water arrives in the collecting channel a further dose of Alumina is added to ensure satisfactory flocculation in the filters.

Three Rapid Gravity Filters are provided each 16-ft. by 8-ft., equivalent to a filtration area of 384 square feet.

Each of the filters is equipped with an inlet penstock valve fixed in the collecting channel, into which the water passes from the sedimentation tank—the penstock valves are operated by horizontal spindles and hand wheels placed in the center of each filter.

Automatic outlet control valves are placed in an inspection chamber on each filter. These outlet controllers are an important feature of the plant as they ensure that the designed rate of flow during filtration is not exceeded at any time, so that by the resulting smooth and constant discharge the filter maintains a high level of efficiency. These same valves automatically allow a short period of time to elapse when the inlet valve is opened after the filter has been cleansed, so that there is an opportunity for a partial reforming of the surface film before effluent is fed to the sump.

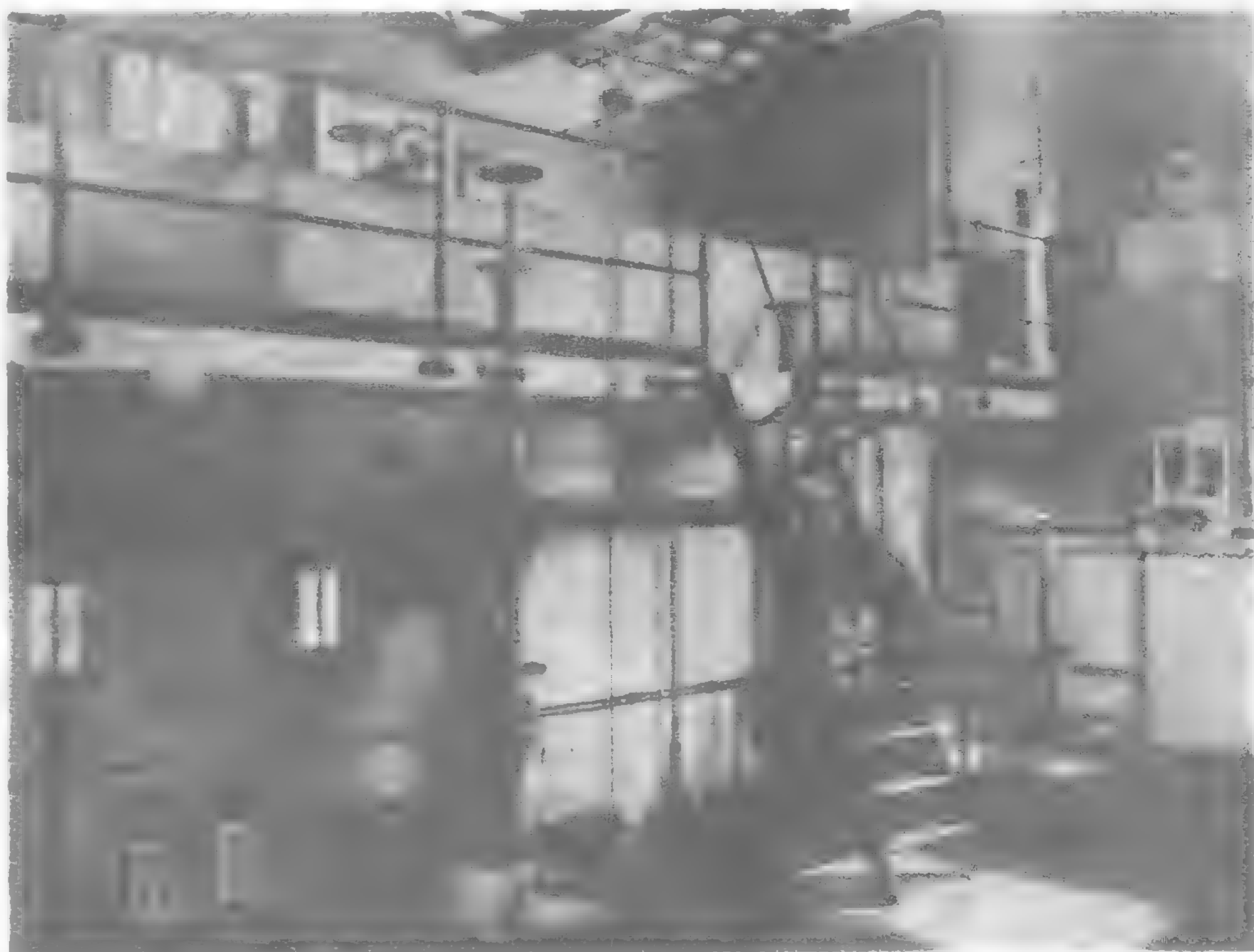


Fig. 5.—Interior of Filter House

Air inlet and wash water valves are fitted to each filter.

By-pass valves are fitted to each filter to enable the outlet inspection chambers to be discharged direct to waste when necessary—they are also a distinct advantage for allowing the filtered water to be discharged to waste if for any reason this is desirable, in preference to closing down the plant.

The underdrainage system comprises lateral tubes perforated on their under-sides and connected by tee pieces to a C.I. header built into the filter floor. Owing to the acid nature of the water in this plant, the laterals are constructed of solid drawn copper; no steel or galvanized iron is used.

The uniform collection of the filtrate from the whole area of the filter is of the greatest importance, thus each and every part of the filter bed is compelled to perform its own portion of the work; local filtration results in rapid rates of flow through certain portions of the bed, while other parts are working slowly.

The system of air and water seals is specifically designed to ensure the instantaneous application of air for cleansing the media evenly over the whole area of the filter bed. When tested under working conditions, this object certainly appears to have been achieved.

The underdrains are also designed with the object that the wash water shall be spread over the whole filter, so that the whole of the media is completely and thoroughly cleansed, and here again an examination of the surface sand after cleansing points to an efficient design.

Another important point is that one set of pipes performs all three operations of filtering, air cleansing and reverse flow washing, thus reducing the amount of mechanical equipment submerged in the filter to a minimum.

The pipes are buried in a 6-in. layer of 3-in. pebbles, and above this again are layers of similar pebbles, gradually decreasing in size until they finally support a bed of sand 2-ft. 1-in. thick. The total depth of the filter bed is 3-ft. 6-in. This sand is of special size and, with the pebbles, was imported from Leighton Buzzard. The engineer-in-charge, Mr. J. S. Boissier, expressed the opinion that although many attempts had been made to substitute local sand of similar quality in other filtration plants in this country, the original saving in cost had seldom been justified.

The cleansing process is carried out in what can be described as the standard manner for air scour filters. The raw water is first run off to waste through the waste channel which runs from back to front of the filter tank at approximately 15-in. above the sand level. Air and wash water are then successively applied, until the color of the wash water remains fairly constant. The air scour may continue for three minutes, the wash water for five minutes and the formation of the filter film a period of 15-20 minutes,



Fig. 6.—Showing Pipe Line Crossing Swamp Subject to Flood

a total of some 25 minutes for best efficiency, although this time can be diminished by reducing the effectiveness of the cleansing process. One filter is dealt with at a time, and during this period the other two units continue their supply, the clear water sump holding sufficient water to provide what is required for washing without interrupting the delivery to the supply main.

The clear water sump below the floor of the filter house is divided by a partition wall. The filtered water falls into the part under the front floor, where it is chlorinated, and then passes backwards and through a tunnel into the section under the filters, where a further dose of soda ash is added to give the desired alkalinity, thence once more, through a siphon tunnel, under the floor and out into the delivery main.

Rate of flow and loss of head indicators are fitted to each filter. The former are controlled by visible floats and indicate on a scale the volume of water passing from the inspection boxes to the clear water sump, the scales reading in both gallons per hour and gallons per 24 hours. The loss of head indicators are fixed to the filter fronts and are mercurial.

The chloronome is fully automatic and controls the dosage from the main weir. In the event of the plant closing down the supply of chlorine is automatically cut off, and a feature is the all ebonite absorption tower which is completely submerged, thereby preventing any possible chance of leakage or smell of chlorine.

The mechanical plant consists of a 20 h.p. two cylinder high speed high compression crude oil Tangye engine, running at 1,000 r.p.m., and driving, through clutches, either a Rootes type air-compressor, which provides 384 cubic feet of air per minute at a pressure of 4 lbs. square inch for the air scour (i.e. three cubic feet per sq. ft. of filter per minute), or a Tangye Centrifugal pump which delivers 1,300 gallons of wash water per minute at a pressure of 30-ft. head.

600-ft. down the pipeline the necessary head is available for an indicating and recording Kent Venturimeter, which has been installed at this point.

The cost of the Filters, Tanks, Machinery, Venturimeter, buildings, etc., approximated to \$52,000.

The Supply Main

The 12-in. main continues for nearly two miles to the main road, where a 6-in. branch provides the Rembau supply and where it is reduced to 10-in., at which size it remains until it reaches the Coast, 21 miles away.

These pipes are in the nature of an experiment for Government Waterworks in Malaya, in that they are of steel and not cast iron. On account of the high pressures involved the latter would have been costly and it is estimated that a saving of some \$150,000 was made under this head. Steel pipes centrifugally lined with concrete or bitumen were also considered and rejected on account of cost. Concrete lined pipes would have involved an extra cost of some \$80,000 based on a normal tender, although a special offer was received reducing this to \$34,000.

The pipes used were British Mannesman solid drawn tubes, supplied in random lengths of from 20 to 30 feet, with a certain proportion of shorter lengths for awkward places. They were jointed in the usual way with lead wool, molten lead and yarn. The metal is protected on the inside by a thick coating of Bitumen applied at the works by dipping and slow rotation, and on the outside by a double layer of Jute Hessian soaked in bitumen and spirally wound, with a final coat of whiting to minimize stickiness. The joints, after testing, received a similar wrapping.

Work was commenced on the 23 miles of pipeline on March 6, 1932, and water was delivered at the far end on October 1, 1932.

The line starts in jungle with precipitous and rocky ravines and thence through rubber estates to the main Seremban—Tampin Road, a distance of two miles, from which it strikes off through very hilly and steep rubber land until it meets a secondary road, five miles further on, at Kombok. It mostly follows this road to

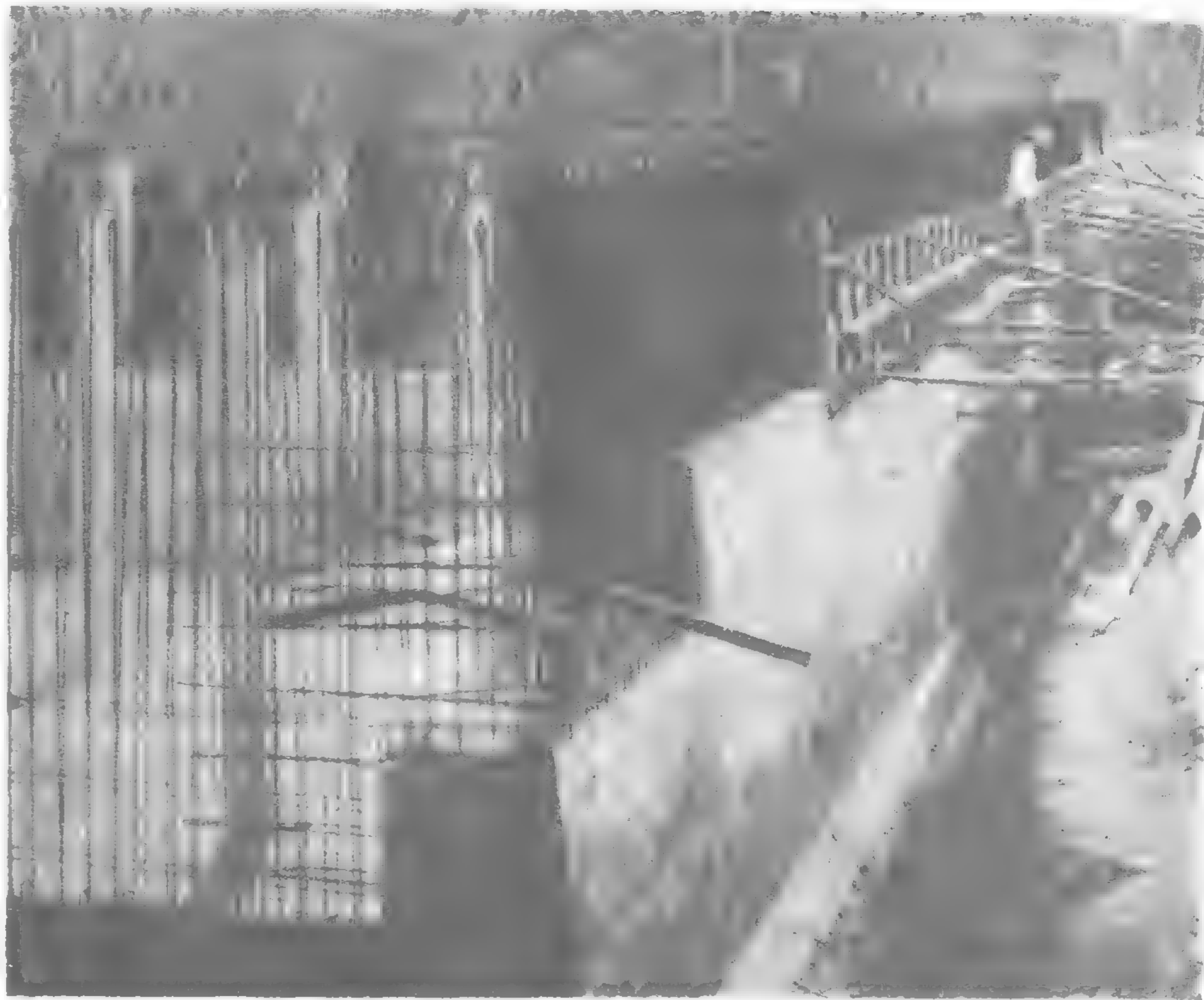


Fig. 7.—Si Rusa Reservoir Under Construction

Siliau at the 15th mile, when it again cuts into hilly rubber land alongside the Railway, to Si Rusa at the 19½ mile, where is the main service Reservoir. Thence 1½ miles through rubber to an estate road, which it follows until it reaches the Coast at the 23rd mile. Ease of access was a determining factor in the selection of the line and partly accounts for the low costs attained, whilst future maintenance will be simplified thereby.

The pipe is buried except in swampy land where it is on banks whilst over ravines and areas subject to flood it is carried on concrete piers and pile trestles. In one stretch of particularly bad rice fields, 900-ft. of cast iron pipe with flexible Victaulic joints were substituted for the steel pipe. Crossings occur over the Railway in three places, and over one river 120 feet wide.

After jointing, the pipe was subjected to a test pressure of 600-ft. head, nearly double that to which any part of it can be exposed in practice, and this was maintained for a minimum period of two hours, and the measured leakage from the joints was required to be less than 2½ gallons per hour per mile of 10-in. pipe, a stringent test that was nevertheless successfully surmounted.

The usual accessories of stop valves, air relief, scour valves, flexible joints and anchor blocks are provided where necessary. These anchor blocks for a 12-in. pipe were called upon to withstand a thrust of 10 tons against the test head.

A length of 200-ft. of experimental removable pipe is inserted, consisting of different samples of cement and bitumen lined pipes, and of asbestos pipes. The condition of these after a period of years should enable future generations to estimate accurately the value of the rival claims by the protagonists of each material.

The cost of this section of the mains totalled \$305,000, which includes all fittings, bridgings, supervision and other extras.

The 12-in. pipe cost \$3.51 per foot laid, all-in.

The 10-in. pipe cost \$2.50 per foot laid, all-in.

Si Rusa Reservoir

The main Service Reservoir is at the 19½ mile near the Railway at Si Rusa.

The 10-in. main delivers through a bye-pass into this by means of a Lerner-Johnson Float valve, a type especially designed to prevent water-hammer.

The Reservoir has a capacity of 600,000 gallons and measures 95-ft. by 74-ft. 6-in. The depth of water is 13-ft. 3-in. with T.W.L. at 214.00 above M.S.L. It is of Reinforced Concrete and is roofed, the roof having 9-in. of earth over, the whole being buried in the ground.

The walls are designed as being fully fixed at the bottom by the base slab and supported at the top by the roof slab.

The floor consists of a concrete slab 9-in. thick, laid in a bottom layer 4-in. thick and a surface layer 5-in. thick, this top layer being reinforced by $\frac{3}{8}$ -in. diameter bars at 7-in. centers both ways at the bottom of the slab. The base slab of the wall is nine feet wide and 12-in. thick, and projects 2-ft. behind the wall which is 12-in. thick at the bottom and 9-in. at the top. The roof, which is 4-in. thick, is supported by main beams of 13-ft. span measuring 19½-in. by 8-in., and secondary beams of 16-ft. 9-in. span at 6-ft. 6-in. centers measuring 17-in. by 8-in., the beams being supported by 25 columns 12-in. square.

A partition wall 7-ft. high divides the reservoir into two compartments and provides for cleaning or minor repairs.

Subsoil pipes 4-in. diameter around the walls and below the floor drained the excavation during construction and allow of any future leakage being traced. A pneumatic depth gauge is contained in a valve house which also gives access to a chamber containing the control and scour valves. The overflow passes through an enclosed slot into a vertical pipe and thence underground through the main drainage pipe. The usual manholes and ladders give access to the interior.

The cement used was rapid-hardening Tunnelite, and was in the proportions of 1 : 6 by weight in the lower floor slab and roof and 1 : 4½ in the remainder. The aggregate was crushed and screened limestone chippings, graded for maximum density between 1-in. and ½-in.

No rendering was used, but the interior received three coats of P.84 Sodium Silicate applied by spray.

The reservoir is designed for full water pressure with no earth, and for full earth pressure with no water. The maximum stresses in the walls and base slabs are 12,000 lbs. per square inch in the steel and 600 lbs. square inch in the concrete. The roof is designed for 40 lbs square feet live load, in addition to its covering of earth. The maximum pressure on the ground, which is good laterite earth and clay gravel, is one ton per square foot. The contraction joints are formed by stepped concrete with a tapered groove ½-in. wide and 3-in. deep, the bottom 2-in. being caulked with bituminous yarn, and the remainder of the joint pointed with Masticon compound.

The walls were constructed with panelled shuttering in 3-in. lifts: all stoppage points were staggered and contained a strip of Anderson's Bitumastic sheeting ½-in. thick and 6-in. wide. Some difficulty was experienced with this owing to its collapsing, when in position, under the heat of the sun. There was no leakage on completion. The completed reservoir with its fittings, fencing and grounds cost \$26,000.

Delivery Main from Service Reservoir

The distance from the reservoir to the Coast is 3½ miles and this is covered, as before stated, by a 10-in. steel main.

At the Coast the main divides and one 6-in. branch supplies Port Dickson Town, a distance of 2¼ miles, whilst the other proceeds south along the Coast for six miles, three miles of which, as far as the Volunteer Camp, is of 8-in. pipe and the remainder of 6-in. An extension of a further eight miles to Pasir Panjang has been postponed for the present as not likely to produce sufficient revenue.

These and all pipes below 10-in. diameter are of cast iron, centrifugally spun. The 8-in. pipes cost \$1.65 per foot laid, and the 6-in pipes \$1.25.

These pipes are Class B only and suitable for a test pressure of 400-ft. head, but due to unforeseen circumstances they were submitted for eight months to this maximum head at the end of 23 miles of main and gave little trouble.

Subsidiary Supplies

(1) The water to be consumed in Port Dickson town itself is delivered into a 120,000 gallon covered reservoir at 74.00 above M.S.L. from which the reticulation is fed. This reservoir consists of an adaptation of an old masonry conical tank with a new Reinforced Concrete superstructure, and is one of the few adaptations in the whole scheme.

The town is supplied with a reticulation of 4,700-ft. of 6-in., 14,800-ft. of 4-in., and 2,500 feet of 3-in. Cast Iron pipes, some of these being old pipes from the former supply, scraped and painted.

On account of the low service head the reticulation was, as far as possible, designed in loops to equalize pressure during maximum draw-off. The possibility of the supply having to be drawn direct from the Si Rusa reservoir in the future has been provided for by the inclusion of a pressure reducing valve in the supply main.

A system of reflux valves and a secondary bye-pass allow a supply of high pressure water to be obtained instantly by the fire-brigade in case of need.

(2) Further storage is provided at the Camp at the 5th mile by an existing 20,000 gallon tank fed by 1,400 feet of 4-in. and 3-in. main.

(3) The village of Rantau is supplied from a 50,000 gallon reservoir at 184 above M.S.L., 100 feet above the village and distant ½ mile from it.

The Reservoir is a covered circular tank of Reinforced Concrete, 32-ft. in diameter and 10-ft. deep, partly buried and partly exposed, and cost \$3,600.

The reticulation consists of 3,800 feet of 4-in. Cast Iron pipe.

The total cost of the whole of this subsidiary supply was \$8,630.

(4) The supply to Rembau consists of a 6-in. diameter Cast Iron pipe Class C taking off from the 12-in. main two miles below the intake and delivering to a Service Reservoir at Rembau, a distance of 5¼ miles.

The pipe runs partly along the road and partly across country, and crosses the Railway.

It cost \$1.35 per foot run laid. It supplies, *en route*, the village of Pedas and various Kampong centers.

At Rembau the Service Reservoir of 100,000 gallons is still (June 1933) under construction, and the cost will be approximately \$9,000 including all fittings, grounds and fencing. It measures 46-ft. by 36-ft. and has a depth of water of 12-ft. 3-in. Except for granite aggregate in place of limestone, in its principles of construction and dimensions of details it is an exact replica of the Si Rusa Reservoir and is also buried. On account of its small size it has no special valve house or partition wall.

The reticulation of Rembau Town consists of 2,800 feet of 6-in. and 5,400 feet of 4-in. Cast Iron pipes.

The total cost of the Rembau supply will be approximately \$55,000.

Throughout the whole supply area an adequate provision of fire-hydrants and public standpipes has been made.

All supplies are fully metered, both with main and house meters. Apart from the Venturi meter above mentioned, the larger main meters are of the interchangeable Helix type, the smaller main meters are the normal fan pattern, while all the meters to individual supplies are of the rotating piston type.

Cast Iron pipes are all centrifugally spun. The total length of cast iron and steel mains is 42½ miles.

The original estimated cost of the work as now provided was \$969,000 and the actual cost will not exceed \$603,500, or \$619,500 if all the costs of land purchases are included.

Chinese Demand for Factory Plant

Opportunities for the sale of British factory equipment in China are increasing rapidly. As Dr. Yu-Tsuan Ku, head of the Industrial Planning and Promotion Section of the Chinese Ministry of Industries, Nanking, stated in a recent letter to *The British Export Gazette*, the Chinese Government's Textile Industry Development Plan will involve the purchase of British machinery to the value of £1,500,000, while British plant is also being used in chemical, engineering and other establishments. Projects such as the above which are already well advanced, continues Dr. Yu-Tsuan Ku, constitute only a small part of a comprehensive plan for industrial development which is to be carried out during the next five years or so, and it is thus obvious that invaluable business will be offering over a considerable period. During the first quarter of the current year, Great Britain's exports of machinery to China included textile plant to the value of £63,019, machine tools, prime movers and electrical apparatus, and it is confidently expected that the next few months will witness a substantial increase both in the volume and variety of the trade.—*British Export Gazette*.

New Hongkong Bank Building*



MAGNIFICENT new premises for the head office of the Hongkong and Shanghai Banking Corporation, in Hongkong, are to be built. Construction work is to commence within the next few months. The new building will be the last word in bank design, and will also contain offices to be let, and accommodation for members of the European staff, including two squash racket courts.

The site on which the new building is to be erected is considered by many residents to be the finest in the Colony of Hongkong. The new building will cover the existing site and, in addition, a portion of the old City Hall and Theater Royal site and Wardley Street, and will therefore extend the full width of Statue Square. This additional land, together with the present site, gives a total frontage of 247-ft. 6-in. The main axis of the new building will be centered on the Queen Victoria Memorial, which is situated in the center of Statue Square, and the building has been designed to provide a fitting back-ground to the square. The level of Queen's Road is several feet above that of Des Vœux Road; there will therefore be a ground floor and a lower ground floor. Below that a basement will be constructed to accommodate the boilers, pumps, ventilating machinery, etc.

The main banking hall will be at the Queen's Road level and the treasuries, safe deposit, etc., at the Des Vœux Road level. The administrative offices, including those of the chief manager, managers and chief accountant, will face Statue Square. The main banking hall will be about 215 by 100 feet, with a mezzanine at two sides. The height of the banking hall will be 27 feet.

The first, second, third and fourth floors of the building have been designed as offices for letting. They will be light and airy, and applications for space have already been received from prospective tenants. Above the office space in the tower will be

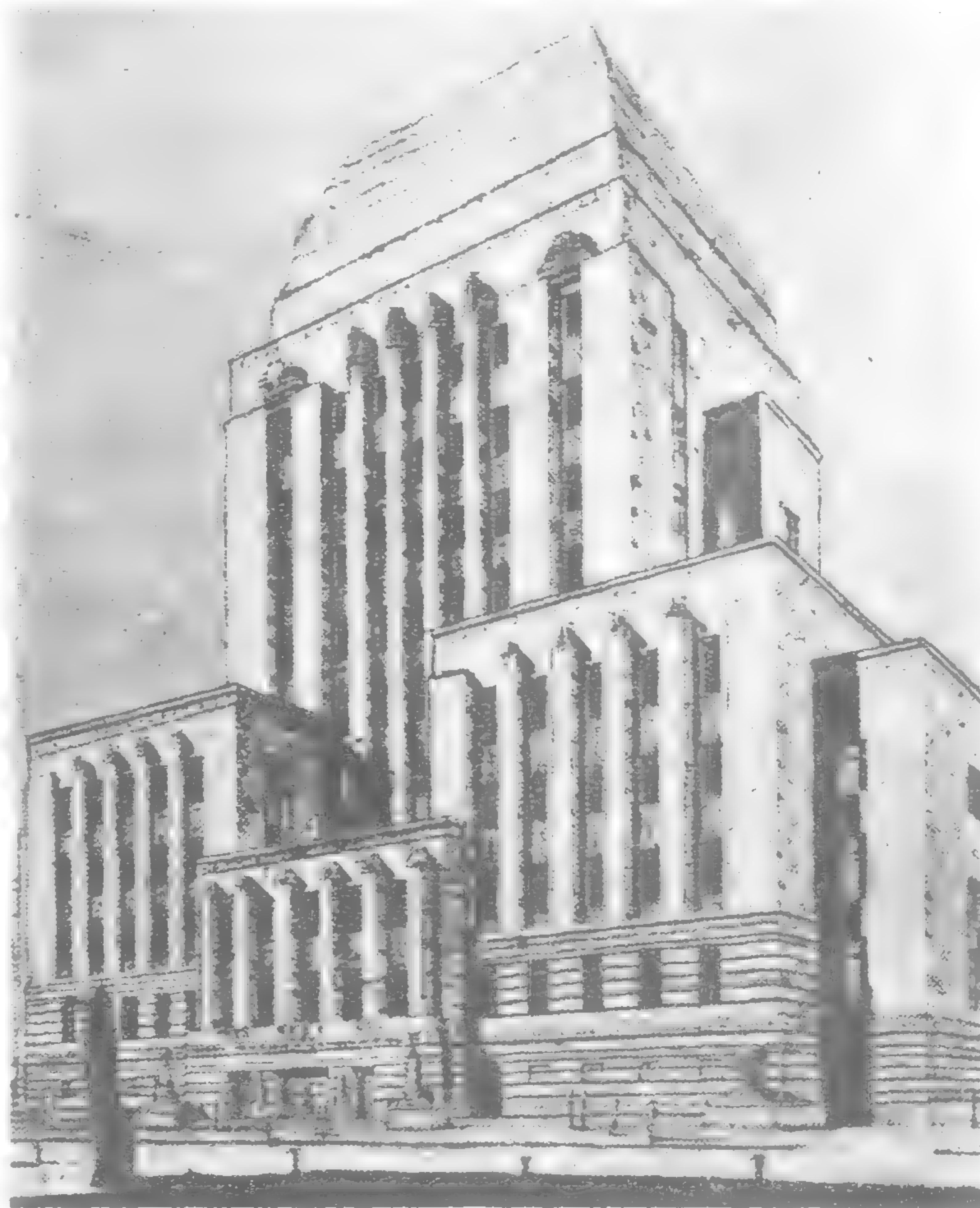
provided quarters for the European staff, including a mess, flats for senior married employees, and a flat for the chief manager. In addition, one floor will be devoted to recreation, two squash courts being provided. The building has been designed on simple and dignified lines, with very little ornamentation. It will be faced with granite throughout. The height from Des Vœux Road to the top of the tower will be about 220-ft., but the stepping back from the wings has been so designed that light and air to adjacent buildings will not be obstructed. The building will be of steel-frame construction and a minimum of wood will be used.

The banking portion of the premises will be the last word in bank design and equipment, being the result of study of the most modern bank buildings in Canada, America, London and the continent of Europe. The ground floor, lower ground floor, mezzanine and possibly a portion of the upper floors will be ventilated by a "conditioned air installation," providing ideal conditions of temperature and humidity, irrespective of external conditions. A portion of the old City Hall building is being adapted for use as temporary quarters for the bank, and it is expected that the move will take place in October, when demolition of the existing premises will be started.

The building is being designed by the Shanghai office of Messrs. Palmer and Turner, Mr. G. L. Wilson, F.R.I.B.A., F.S.I., architect for the Shanghai premises, being responsible for the design of this building also.

The organization and direction of the construction program will be in the hands of Messrs. M. H. Logan and L. W. Amps, M.M. INST.C.E., Chartered Civil Engineers, who are bringing out from England a staff of expert supervisors and special machinery for the purpose.

* *Eastern Engineering and Commerce.*



Frontage Sketch of New Head Offices at Hongkong, for the Hongkong and Shanghai Banking Corporation.

Engineering for Chinese

It is interesting to learn that arrangements are now being made for the training of Chinese students in engineering works in the United Kingdom. This is a matter in which the China Association and the Federation of British Industries have been working hand-in-hand for some time, and the scheme, which has now been formulated, received the blessing of the Chinese Industrial Mission with a promise of full support on its return to China. For many years past isolated arrangements have been made by a few prominent British engineering firms to provide training in their works for one or more Chinese students. Under the new scheme such efforts are to be co-ordinated and developed, not only in view of the benefits derived by other countries, notably, the U.S.A., from similar action on a larger scale, but also having regard to impending industrial developments in China and the tendency for her purchases to pass

increasingly into the hands of Chinese merchants. Opportunity for the systematic development of such training facilities in this country was provided by the China Indemnity (Application) Act, 1931, which authorized the use of a portion of the remitted Boxer Indemnity Funds for purposes connected with the education of Chinese students. Supported by this fact and the strong recommendations of the British Economic Mission which visited the Far East in 1930-1931, a joint committee of the China Association and Federation of British Industries has formulated a scheme whereby British industry might obtain the maximum advantage from bringing Chinese students under British influence, and a grant to defray expenses connected with the technical training of such students in the United Kingdom has been obtained from the Fund mentioned.—*Eastern Engineering and Commerce.*

Motorship Stabilizer is the Invention of Japanese Engineer*

THE disadvantage and discomfort occasioned by the rolling of a ship have been experienced by most ocean travelers. Not only the passengers but the officers and crews alike realize fully what an immense benefit it would be if the rolling motion of a vessel could be eliminated. With this object in view the motorship stabilizer, an anti-rolling device, has been invented after many years of study and experiment.

This stabilizer is small in size and light in weight. The actual weight of a ship stabilizer of this type installed on board the steamship *Mutsu Maru*, a vessel built and engined at the Nagasaki Shipyard of the Mitsubishi Shipbuilding and Engineering Company, Limited, is only 3.98 tons, excluding the construction members of the hull specially provided for the device, such as bulkheads, rudder pockets, and the like. The weight of the quipment on board the cross-channel ferry steamer *Keifuku Maru*, which plies between Shimonoseki and Fusan, is about 15 tons.

This new method for the stabilization of ships was invented in 1920 by Dr. S. Motora, then chief of the experimental tank at the Nagasaki Shipyard and Engine Works of the Mitsubishi Shipbuilding and Engineering Company, Ltd., and the present general manager of that plant. So far, this device has been fitted to three ships and proved to work satisfactorily.

In brief, this stabilizing system makes use of fins projecting from the sides of the hull at about the turn of the bilge. In Fig. 1 is shown one of the fins as fitted to the channel steamer *Keifuku Maru*, which serves to illustrate the construction. The equipment provided for the coasting steamer *Mutsu Maru* is illustrated in Fig. 2. The fins are in the nature of lateral rudders, and both as regards their arrangement and action may be likened to the ailerons

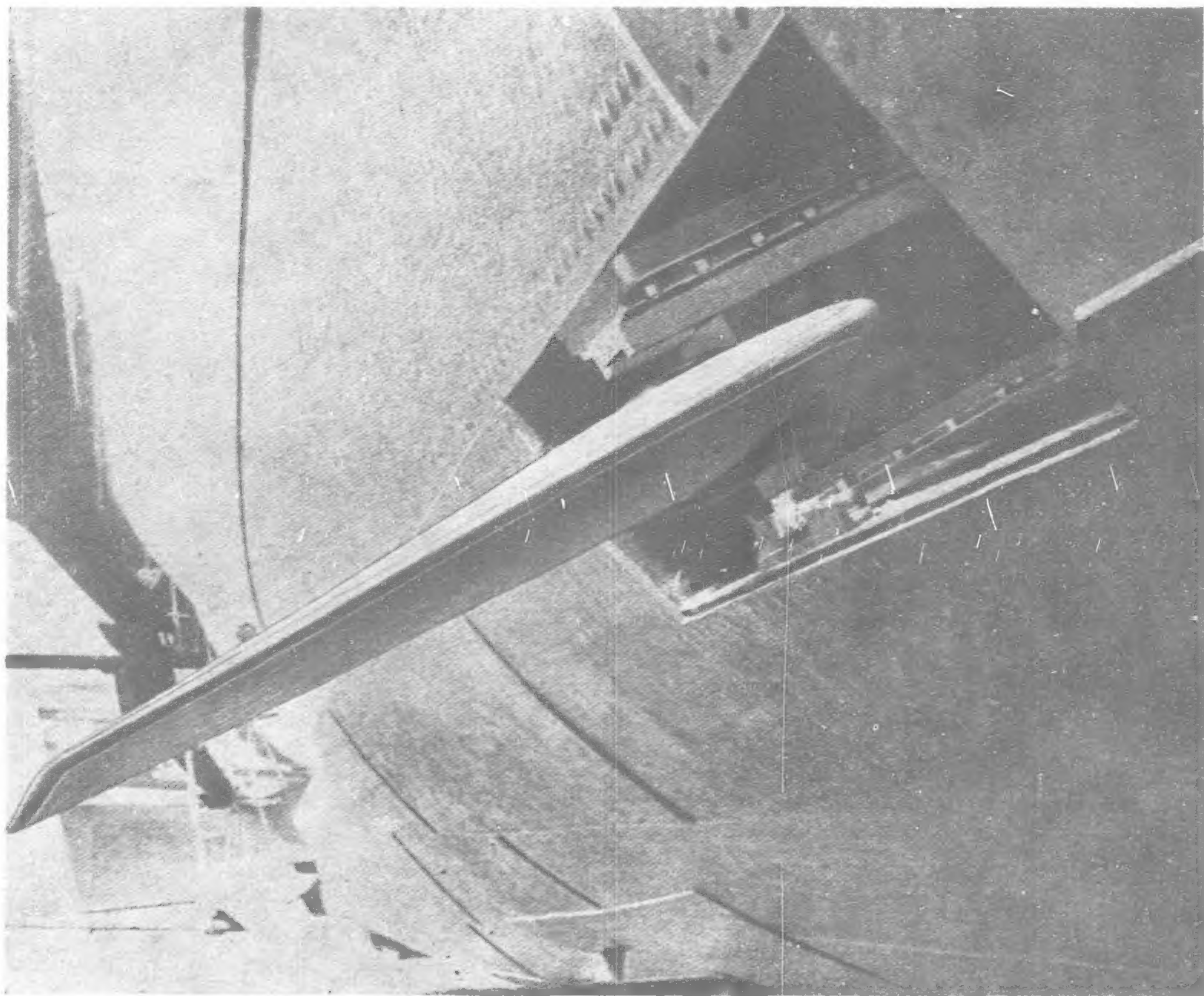


Fig. 1.—Fin of the stabilizer installed on the “Keifuku Maru”

of an aeroplane. They are capable of being turned about an axis offset relatively to their centerline after the manner adopted in a balanced rudder.

These fins are so controlled by a special steering gear that, as the ship rolls, the leading edge of the fin on the side having the motion to be immersed (not the side of immersion) rises, while the leading edge of the fin on the other side descends. The forward velocity of the ship causes the water to exert an upward force on the fin which has tilted up on the descending side of the ship, and a downward force on the fin which has tilted down on the ascending side of the ship. Thus a righting couple is created to act in the direction opposite to the angular velocity of the rolling of the ship. Here it must be specially mentioned that the fins act to stabilize the ship so long as she has an angular velocity of rolling, irrespective of her inclination whether it is upright or otherwise. This can be seen from the construction of the nerve center of the Motora stabilizer.

The nerve center is a small gyroscope that has two degrees of freedom, namely, its rotor spins on its horizontal axle (parallel to the lane of the deck) inside a casing which is so mounted that it is capable of making precessional oscillations around a vertical axis (parallel to the mast) with proper restitution and damping against the oscillations. The gyroscope is so fitted to a part of the ship that its axle directs athwartships when the ship makes no rolling.

Now, when the ship rolls and thereby forces the gyroscope to change the direction of its axle, the latter makes precessional motion around the vertical axis to respond to the angular velocity of the rolling. As it precesses in one direction or the other, it closes

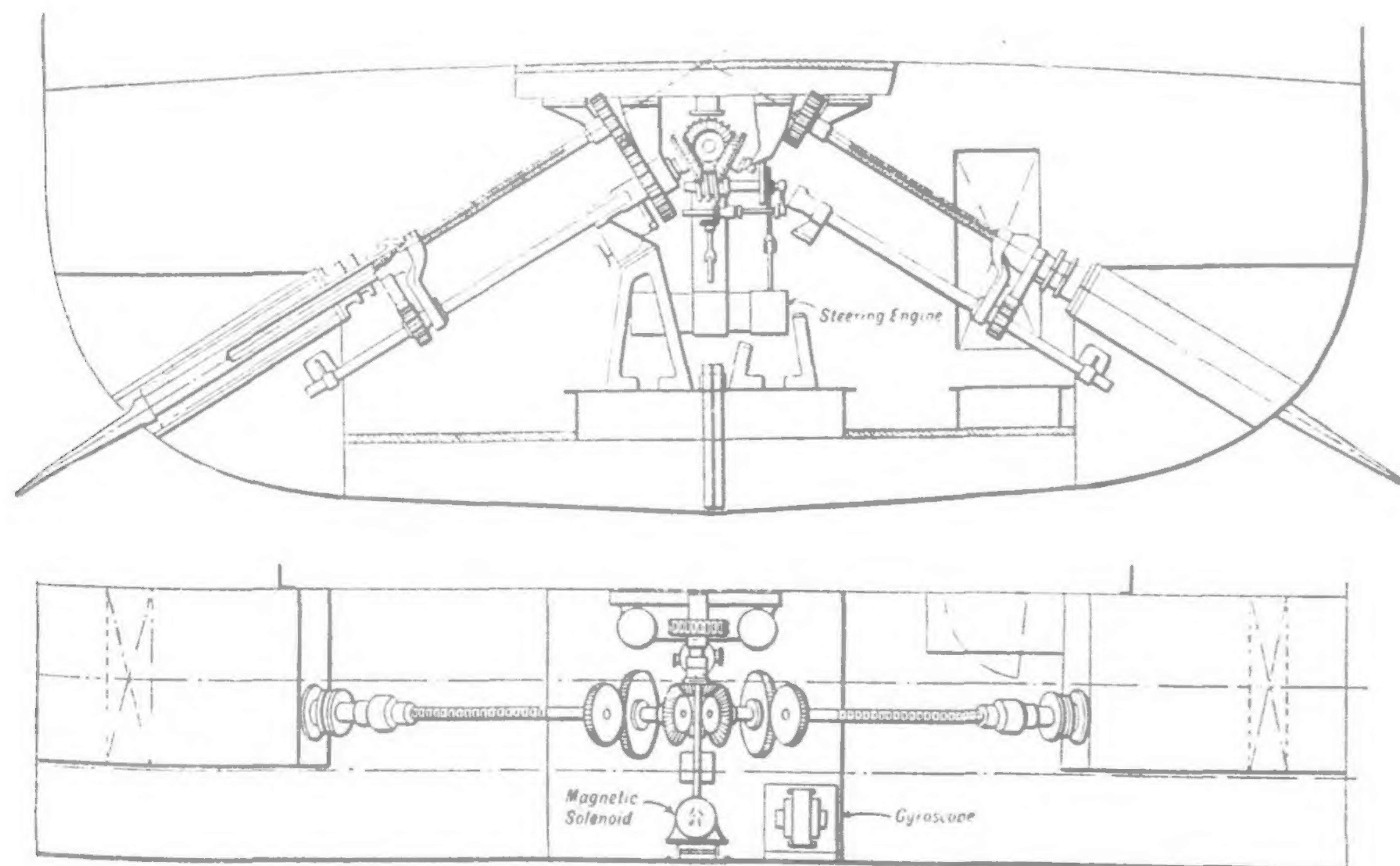


Fig. 2 —Arrangement of stabilizer on the Mutsu Maru

one or other of the contacts of an electric relay. This electric relay serves, in turn, to manipulate a reversing electrical switch through which an electric current flows to energize one or other of a pair of strong electro-magnetic solenoids which control the differential valve of the gear to maneuver the fins. Though not yet actually tried, the construction of the two step relays

may be much improved by the use of heavy-current vacuum valves, such as the thyatron, which are in vogue as electric relays.

In this system the fins can be withdrawn into recesses when they are not in use; so in calm water decreasing the resistance of the ship below the normal resistance exerted by ordinary bilge keels. The steering engine can be used to withdraw the fins into the recesses.

Means for controlling the angle of tilting of the fins are employed so as to produce an appropriate stabilizing couple at various speeds, and in some cases several pairs of fins are provided, and any number of them can be used according to the speed of the vessel.

The tilting motion of the fins is reversible by merely changing over the switch, so there is no tendency for the ship to be rolled artificially when going astern, but, if necessary, the ship can

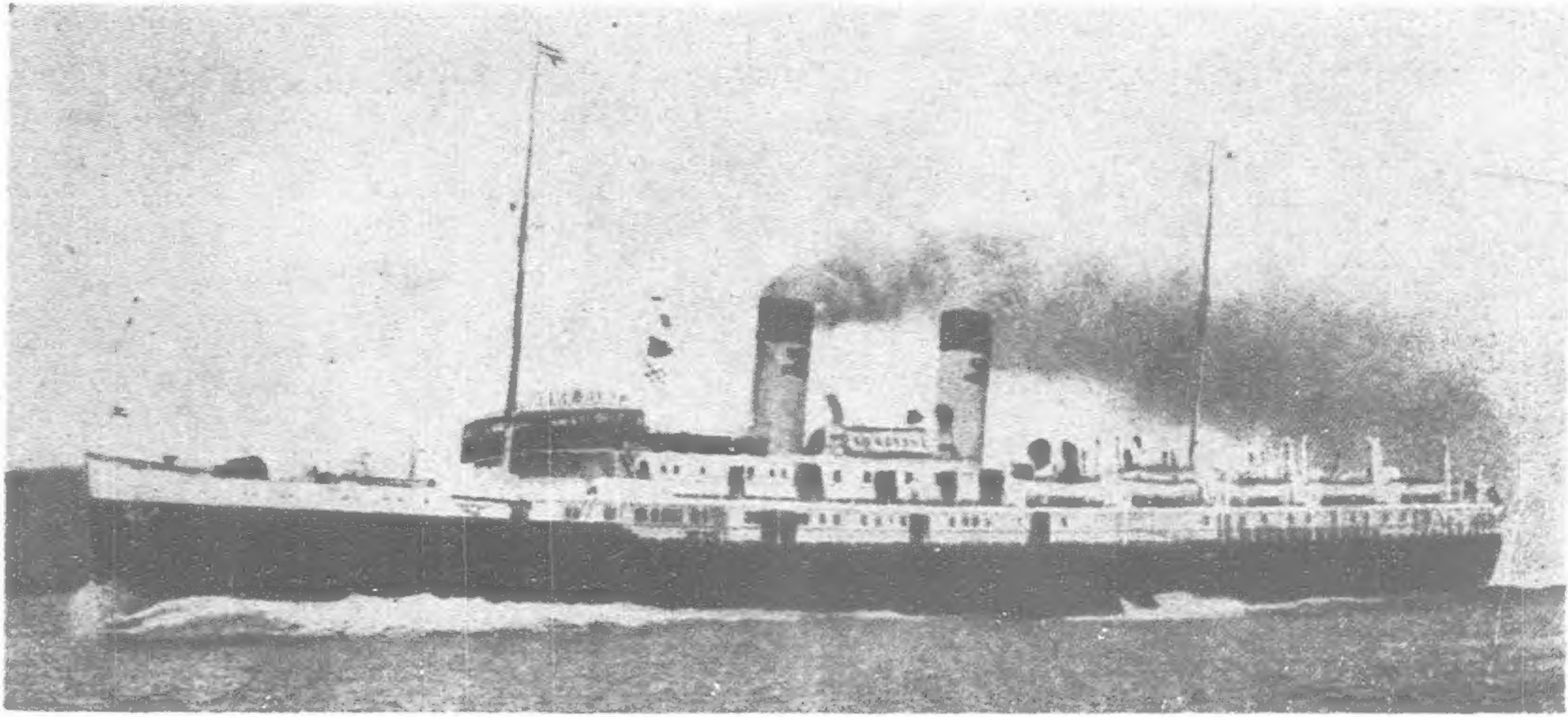


Fig. 3.—In 1924 a Motorship stabilizer was installed on the Japanese Government ferry steamer "Keifuku Maru"

likewise be rolled artificially.

By setting the fins at a fixed angle of tilt, the ship running with a heel to one side, can be brought upright and vice versa.

It has been ascertained from the results of tank experiments that the gain of power realized as the result of a reduction in the rolling is in excess of the drag of the fins, and in any weather conditions the propulsive resistance is

always less when the ship is fitted with fins than when she is fitted with bilge keels instead of fins. Apart from this, it will be recognized that in rough weather the drag of the fins is a minor factor compared with the augmentation of resistance of the hull due to the heavy wind and sea.

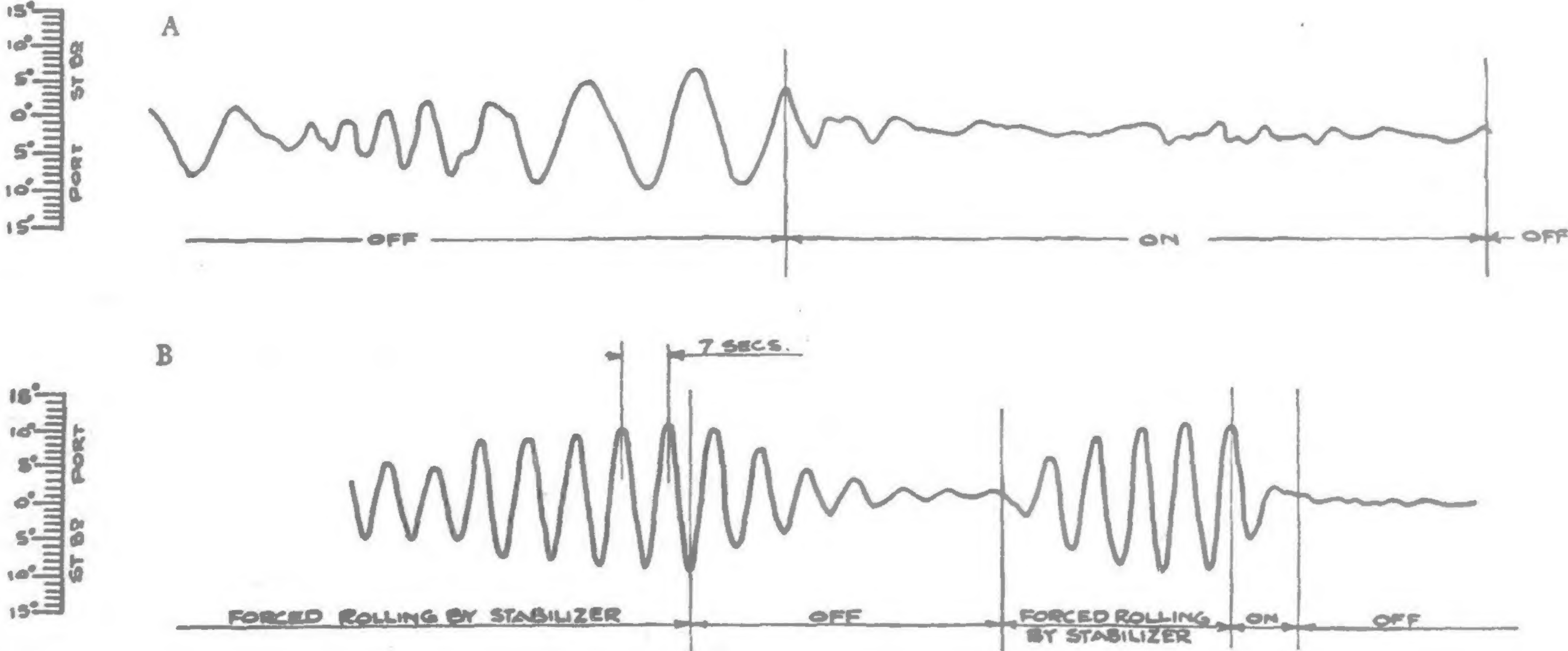
The Matora stabilizer was, for the first time, installed in the small passenger coasting steamer *Mutsu Maru*, built at the Nagasaki Works of Mitsubishi Shipbuilding and Engineering Company, Ltd., in 1923. This ship was to ply between Hakata and Tsushima across the Korean Channel, which is well known for its extremely rough seas. For this reason this ship was suitable to test the action of the anti-rolling device.

On this test, when the stabilizer was brought into action, the maximum amplitude of rolling was about eight degrees, while when

RESULT OF TEST ON THE "KEIFUKU MARU," 1924

| HULL. | | | FINS. | | | DETAILS. | | |
|--------------|----|-------------|------------|----|-----------------|--------------|--------------------|--------------------|
| LENGTH | .. | 360' 0". | NUMBER | .. | 1 on each side. | DATE | A. Feb. 24th 1925. | B. Dec. 26th 1924. |
| BREADTH | .. | 46' 0". | LENGTH | .. | 7' 0". | PLACE | Shimonoseki-Fusan. | Iki-Shimonoseki |
| DEPTH | .. | 26' 0". | BREADTH | .. | 5' 0". | COURSE | .. N.W. | .. E. |
| DRAUGHT | F. | 14' 11". | AREA | .. | 34.3 sq ft. | WIND | .. N.W.5 | .. N.E.1. |
| | A. | 15' 5 1/2". | MAX. ANGLE | .. | 22 1/2°. | SEA | .. Rough | .. Calm. |
| DISPLACEMENT | M. | 15' 2 1/2". | | | | SPEED | .. 15.5 knots. | .. 17 knots. |
| | | 3,944 tons. | | | | ANGLE OF FIN | 20 1/2° | 22 1/2° |

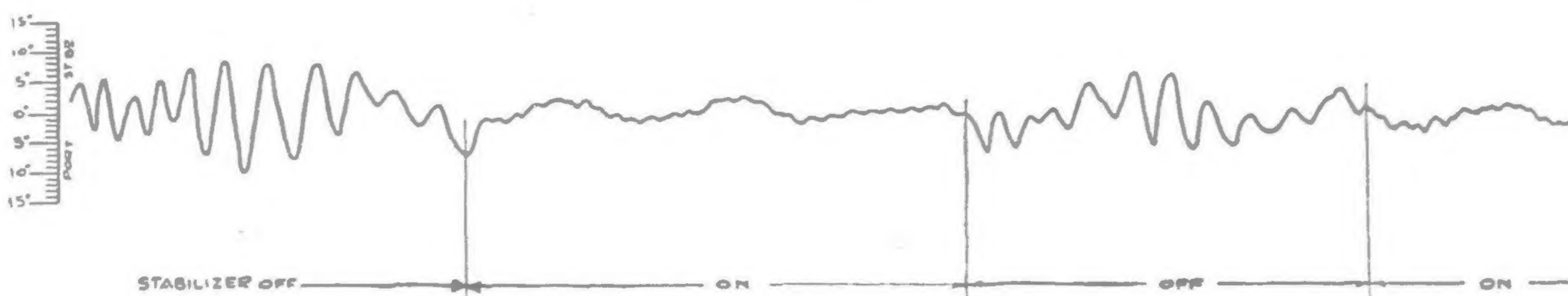
RECORD OF ROLLING



THE No. 4. IMPERIAL JAPANESE NAVAL MINE SWEEPER

| HULL. | | FINS. | | DETAILS. | |
|--------------|--------------|------------|-----------------------|--------------|-------------------------|
| LENGTH | .. 235' 0". | NUMBER | .. 4 on each side. | DATE | .. May 15th 1925. |
| BREADTH | .. 26' 4". | LENGTH | .. 2' 6". | PLACE | .. Ichie Misaki |
| DRAUGHT | .. 7' 6". | BREADTH | .. 2' 0". | | .. Wakayamaken. |
| DISPLACEMENT | .. 700 tons. | AREA | .. 4 8 sq. ft., each. | WIND | .. Strong on Port side. |
| | | MAX. ANGLE | .. 25° | SEA | .. Rough. |
| | | | | SPEED | .. 14 Knots. |
| | | | | ANGLE OF FIN | .. 15°. |

RECORD OF ROLLING



it was off, the same was 23 degrees; mean amplitudes in the two cases being two and 13 degrees respectively. It should be remarked that when the fins were not brought into action, they were not withdrawn but only fixed, thereby acting as ordinary bilge keels. If the fins had been taken into the recesses, the amplitude of rolling might have been a few degrees more.

In 1924, the second Motora stabilizer was fitted to the *Keifuku Maru*, Fig. 3, one of the ferry steamers owned by the Imperial Japanese Government Railway Department. She was built in 1919 at the Kobe Works of Mitsubishi Shipbuilding and Engineering Company, Ltd., and put on service between Shimonoseki and Fusan, which is a course also well known for its roughness.

A rolling record taken on a sea trial is reproduced in Fig. 4. Diagram A shows the rolling of the vessel. Diagram B was taken on a trip to Shimonoseki from Nagasaki after the completion of the machine. On that occasion the sea was too calm to test the action of the machine, so that the following test was conducted. After reversing the relay which controls the electric current through the magnetic solenoids, the stabilizer was put into action to create rolling instead of diminishing it. When the amplitude of the forced rolling thus produced attained a sufficient angle, then in one case the electric current was simply switched off leaving the ship to roll freely, and in the other case the electric current was switched on so as to damp the rolling by the action of the fins. The curves of declining angles for these two cases show clearly that the machine was very effective in checking the rolling of the ship.

The third Motora stabilizer was installed in one of the naval mine sweepers and was tested by the Japanese naval authorities. Both the ship and the stabilizer were completed in March, 1925.

As the arrangement of the ship prevented the installation of one complete set in one compartment, four small fins were fitted on each side of the ship, and the arrangement of withdrawing the fins was abandoned.

For control the four fins on each side were grouped into pairs. Each pair of fins was worked by a set of hydraulic apparatus of special design. The hydraulic power was supplied by two sets of steam pumps of the Weir type through a controlling valve placed between the pumps and the hydraulic cylinders. The steam to the pumps was governed by a very sensitive regulating valve so as to keep the pressure in the air vessels of the pumps at a constant pressure. The controlling valve was automatically controlled by a small gyroscope in a manner similar to that described for the *Mutsu Maru* and the *Keifuku Maru*.

Fig. 5 shows records taken on board the vessel during a very heavy gale on May 15, 1925, when she was steaming off Wakayamaken. Again the record shows the splendid results obtained by the device and how the heavy rolling was immediately reduced to a negligible movement. It will be observed that in this case the ship was subjected to slow tilting motions from one side to the other, even when the rollings were practically suppressed by the action of the fins. Very probably these slow tilting motions were due to the action of the veering wind.

Y.20,000,000 for Rashin Port

The South Manchuria Railway Company has decided on the plan of constructing the harbor of Rashin, a northern port of Chosen on the Japan Sea coast, at a cost of about Y.20,000,000 over a period of five years as a work of the first stage.

The plan will be submitted to the coming general meeting of shareholders of the company in Tokyo, and thereafter the company will negotiate with the Overseas, Home, and Finance Offices about the realization of the plan.

With the completion of the Tunhua-Tumen railway, which connects Northern Chosen with Kirin and Hsinking, and with the prospective commencement of the work of construction of the port of Rashin, a rapid industrial development of Northern Chosen is promised.

The Mitsui Bussan Kaisha plans to construct a bean mill in Northern Chosen to utilize soya beans, which will be transported

from the granary of North Manchuria and the region of Chientao to Chosen by the new railway, and it is reported that the company has already purchased the site for the mill in the suburbs of Seishin.

Part of the machinery of the Santai Mill, owned by the Mitsui Bussan Kaisha, will be moved to Seishin, and the company is now negotiating the matter with the Government-General of Chosen.

When the mill is established bean, cake and oil will be supplied to the Japan Sea coast region of Japan Proper at a cheaper price than those products shipped from Dairen. Many other factories will be built in Northern Chosen, and the Dairen Chamber of Commerce and Industry is studying the effect that the industrial development of Northern Chosen will have on the Dairen and Kuantung Territory.

Engineering Notes

INDUSTRIAL

MUKDEN ARSENAL.—In furtherance of its plans for the development of industry, the Manchukuo Government has decided to convert Mukden Arsenal to the manufacturing of harvesting, commercial and industrial implements. These are considered urgent, and the provincial authorities are advancing Y.150,000 for a start.

PAPER MILL FOR CHEKIANG.—Tsing-tien, near Wenchow, in Southern Chekiang, is favored for the establishment of a paper mill, according to technical experts of the Ministry of Industry, who recommend the quality and abundance of raw materials available and the practicability of installing a hydro-electric power plant.

MANCHOUKUO CEMENT.—Mr. S. Kitabayashi, formerly with the Asano Portland Cement Co., has obtained the sanction of the Manchoukuo Government for establishment of a cement company in Manchuria under joint management of Japanese and Manchurians. The company will be capitalised at Y.5,000,000, half to be paid.

FORMOSAN PAPER WORKS.—Mr. Heizaburo. Okawa, former president of the Fuhu Paper Company has decided to establish the Taiwan Paper Business Company with a capital of Y.5,000,000 totally paid by himself. The new company, unlike existing companies using pulp, intends to use waste Formosan sugar cane for making printing paper.

BEER PLANTS FOR KOREA.—Dai Nippon Brewery, Tokyo, has decided to erect a plant with an annual capacity of 100,000 boxes at Eitoho, near Seoul, and work is in progress. When the plant is completed a subsidiary will be established to operate the new brewery with a capital of Y.6,000,000. Kirin Beer also is building a plant with similar capacity at the same place. The operating company will be the Showa Kirin Company. Consumption of beer in Korea has been gaining recently, due to the greater purchasing power of the population.

CEMENT WORKS FOR MALAYA.—The chairman's speech at the Malayan Collieries meeting referred to the probability of developing a cement industry as a subsidiary. By far the largest and most important undertaking which we have under consideration is, he said, the proposed cement works, with quarry and transportation system. Proposals have been submitted to the Government, and meantime, pending the decision, everything short of placing contracts has been done. Technically, the works under consideration will be quite the last word in efficiency. A member of the board will shortly confer with consulting engineers in London and with the principal tenderers for the supply of the plant.

FISHING STATION PLANNED.—An appropriation of Y.10,000,000 for five years' work in the establishment of a permanent fishing base at Horomushiro Island in the Kurile group is to be included in the coming Japanese budget. The first year's appropriation will be about Y.300,000 and will be used for surveys and plans. A permanent base is considered essential for large-scale Japanese fishing. At present about 400 operators employ more than 20,000 fishermen, and they have been forced to go to Hakodate and Otaru for provisions and equipment, necessitating a ten-day voyage each way. For a permanent station on Horomushiro plans are nearly complete, and five years will be required because laborers are prevented by frigid temperatures from working more than five months of the year. The base will have a spacious harbour, coal depot, water supply station, ship-landing piers and warehouses on a large scale.

RAILWAYS

NEW RAILWAY IN MANCHURIA.—The Manchoukuo communication authorities are constructing an important railway, 268 kilometers long, to link Harbin and Lafa in north Manchuria. A statement indicates that the new line will not only open up the rich central part of Heilungkiang, but will also form a trunk line of various railways in the future.

INDO-CHINA RAILWAY.—Some time ago the French authorities took up the question of electrifying several railways in their colonies, and also constructing new electric lines. Detailed estimates for the Indo-China, Saigon-Mytho, and Hanoi-Santay lines are now before the French Minister for the Colonies, who is expected to announce his decision shortly.

SHANSI RAILWAY EXTENSION.—It is reported that Yen Hsi-shan, Governor of Shansi, is definitely inviting tenders from European firms for permanent way equipment for the first section of the Tung-Pu (Tatung-Puchoufu) Railway, that is from a point about 60 miles north of Taiyuan to Chiehshiu, south of Yu Tzu, a total distance of 120 miles. A small commission, the members of which are foreign trained, has been sent to Europe to study and report on railway matters generally.

ELECTRICAL

POWER PLANT FOR KOREA.—Mr. Jun Noguchi, president of the Japan Nitrogen Company, and Chosen Nitrogen Company, has decided to establish a water power electric company with a capital of Y.20,000,000 on the Choshinko River in Korea. The enterprise was first planned by the Mitsubishi. The concern aims at generating about 320,000 kw. of power.

POWER PLANTS FOR JEHO.—Plans are under way for the establishment of electric power stations at suitable places to supply electric light and power to various parts of Jehol Province. At present electric light is supplied only at Chihfeng. The power house at Peipiao will be restored to its full capacity of 1,500 kilowatt, and electric current will then be transmitted to Chaoyang and Peipiao. As regards telegraphic and telephone services, a new line is being put up between Chaoyang and Chihfeng.

JAPANESE DEVELOPMENTS.—The railway authorities have decided to complete the power station construction program on the Shinano River not later than the fiscal year 1939-1940. First it is proposed to build the No. 1 Chitose station at a cost of Y.28,000,000. This station, having a capacity of 44,000 kw. is to be completed in the year 1938-39, a commencement being made with the No. 2 Chitose station (40,000 kw.) in the following year. The I.G.R. has also decided to press forward with the construction of the 62,000 kw. Okuniyama station with a view to completing it by August, 1935.

COMMUNICATIONS HIGHWAYS IN CHINA.—General Chiang Kai-shek has given instructions for highway engineers to proceed at once to Kiangsi to complete several roads on which work has been going on for months. It is understood that tools, machinery, and light railway tracks and trucks in large numbers are being transported to different points. Only recently in Nanking, at a special road conference with delegates from the seven central provinces of China, the National Economic Council was entrusted to carry out the completion of 20,000 kilometers of highways involving a total expenditure of over \$100,000,000. Work on some of these highways has already started, and it is expected that next year will see its completion.

JAPANESE ELECTRIFICATION.—Estimates have been prepared for the I.G.R.'s proposed railway electrification schemes for the year 1933-34. A sum of Y.1,803,033 is to be spent on the Kodzu-Numadzu section of the Tokaido line, and transmission lines will be erected between Yugawara and Mishima and between Atami and Numadzu, with substations at Mishima and Yugawara. On the Iidamachi-Chiba section Y.909,600 will be expended, and other lines to be electrified are the Ueno-Senju, Shinagawa-Tsurumi, Kofu-Nirashima, and Haramachida-Hachiojo sections, for all of which, however, the appropriations for the year are comparatively small.

SHIPPING

STEAMERS FROM ENGLAND.—The China Merchants S.N. Co.'s proposal for a loan of £360,000 for the purchase of six new steamers was approved by the Trustees of the British Boxer Indemnity Fund on June 5. According to Shanghai shipping circles, the six steamers the China Merchants propose to purchase from England include four sea-going vessels and two vessels for river service. Three of the seagoing vessels would be of 3,500 tons each and one of 3,000 tons, while the two river ships would be of 3,500 tons each.

PORT DEVELOPMENTS IN CHINA.—Kiangsu Provincial Government is contemplating the development of Laoyao and Hsukow, on the northern Kiangsu coast, as trade areas. It is anticipated these places will gain considerable commercial importance with the completion of the eastern extension of the Lung-Hai Railway. Construction of this extension has been completed as far as Hsukow. The next task is the tunnelling of Sunhia Hill, between Hsukow and Laoyao on the coast. The latter town is the projected site of Haichow harbor.

BILLION YEN CANAL SCHEME.—Nagoya plans the construction of a ship canal 62 miles long, linking Nagoya with Tsuruga, on the Japan Sea. The idea is to have direct connection with North Korea and Manchuria. The canal would be 115 kilometers long, but would use Lake Biwa for 25 kilometers. The difficulty, of course, is that construction of the canal, longer than either the Suez or Panama canals, would cost an immense sum, but the city fathers are hopeful that if the Government decides on large-scale public works to aid the unemployed it will consider this project seriously.

COMMUNICATIONS

TRAMS FOR NANKING.—Three routes have been mapped out by the Reconstruction Commission as the beginning of a tramway system for Nanking. The routes will traverse the busiest sections of the city. The tram lines will be laid down in three stages at a cost of approximately 13 million dollars. The Reconstruction Commission of Nanking has addressed a communication to the Trustees in charge of the British Boxer Indemnity Refund requesting a loan of \$3,000,000 for the project.

MORE BRIDGES FOR CANTON.—With the gigantic bridge across the Pearl River joining the Honam Island to Canton City proper, now in use, the Canton municipal authorities are contemplating the building of a second bridge to cross the river from the West Bund. Yet another bridge is under consideration to link up Canton and Fati. This bridge, which is to be built jointly by the Municipality and the Canton-Hankow Railway Administration, has passed its initial stage, and in fact a provisional contract has been awarded to Messrs. McDonnell and Gorman, the same contractors who built the bridge just finished.